SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XXXIX.—No. 19. [NEW SERIES.] NEW YORK, NOVEMBER 9, 1878. [$3.20 per Annum. [POSTAGE P EPAID.]

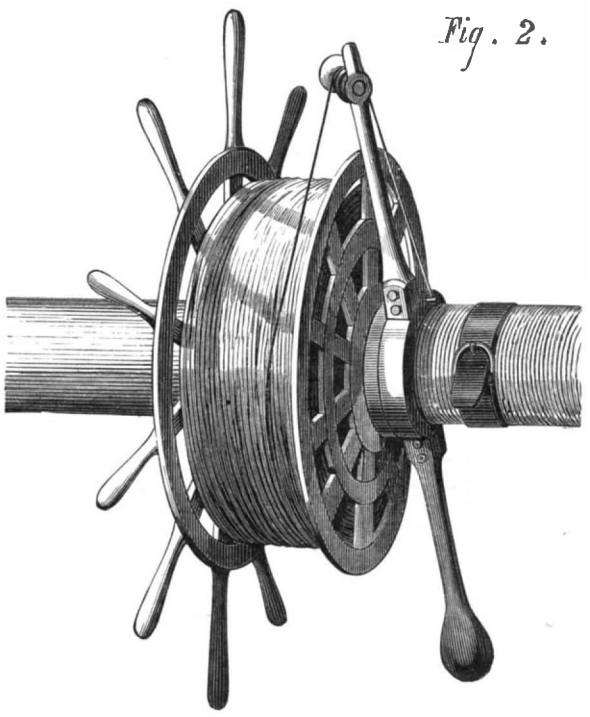
PROGRESS AND PROSPECTS OF THE EAST RIVER BRIDGE.

In following the progress of the East River bridge we have now reached the final stage in the construction of the great supporting cables. The reader will remember that the superstructure of the bridge is to be sustained by four such cables, each composed of 6,300 No. 8 steel wires, lying parallel with each other, making a grand non-twisted rope of steel 16 inches in diameter and 3,500 feet long.

The process of combining the seven interior strands forming the core of each cable was described and illustrated in the SCIENTIFIC AMERICAN for May 18. The accompanying engravings show the method of assembling the twelve exterior strands about the central seven, in the course of which the entire cable is completed and securely wrapped with wire. This is but the repetition on a larger scale of the process of binding the six intermediate strands about the central strand, as already described—with the final process of closely winding the completed cable with wire.

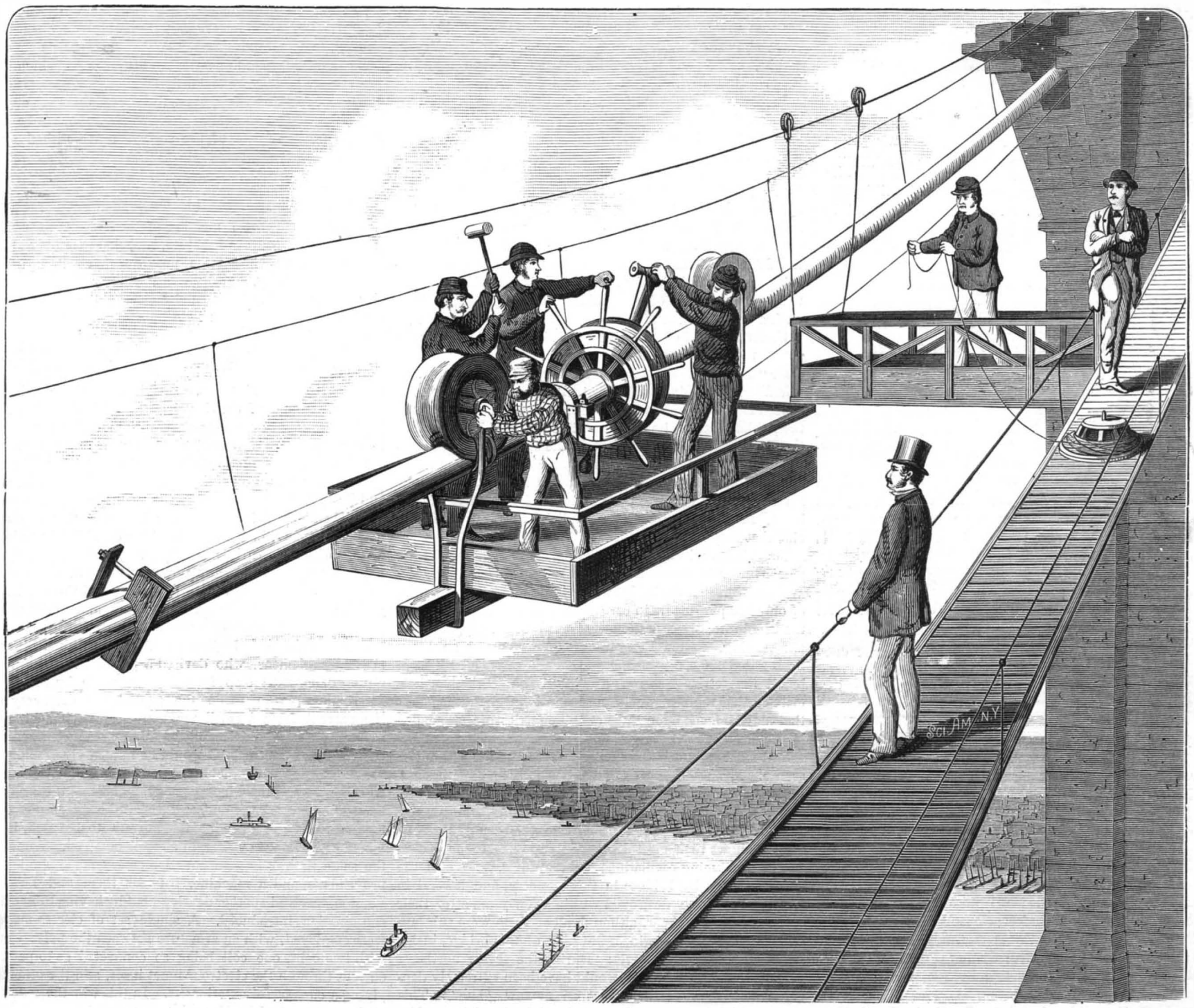
All the strands having been brought together around the core, the lashings of each, and of the central core as well, are removed, and the partially liberated wires are collectively brought into cylindrical form by means of powerful clamps as the winding proceeds. In this operation four men are employed, as shown in Fig. 1. The first manipulates the winding lever; the second attends to the tension of the wire, which he controls by means of the spokes of the drum, while the other two apply the white lead with which the cable is saturated, and with heavy wooden mallets beat the wires together. The winding apparatus consists of a carriage for the workmen, a drum carrying the wire to be wound upon the cable, and a winding lever which turns upon the sleeve of the drum, but independently. The wire is wound upon the drum from a portable reel on the foot bridge, as shown in the upper right corner of the cut.

Fig. 2.



In the process of wrapping the cable the winding wire is carried over one end of the lever (see Fig. 2), thence through a groove in the collar of the apparatus to the cable. The entire apparatus is pushed forward by the pressure of the wire against the collar, the average daily advance being about 10 feet. To hasten the winding, sixteen sets of apparatus are employed, four on each cable. In every instance the winding is begun at the towers, two gangs working shoreward from the towers on each cable, and two from the towers outward to the middle of the river. As a guard against unwinding in case the wire should break, a stout strap is buckled about the cable as close as may be to the winding apparatus.

These operations, though simple in themselves, acquire a special interest from the circumstance that they are carried on at such a gigantic scale and at such an enormous elevation above the river. The length of the river span is 1,595 feet 6 inches; the clear height of the bridge at the center of the span is to be 135 feet above high water; and the total height of the towers 277 feet. The entire length of the bridge is 5,989 feet; its width 85 feet. Its construction was begun in January, 1870.—[*Continued on next page.*]



THE GREAT SUSPENSION BRIDGE BETWEEN NEW YORK AND BROOKLYN.

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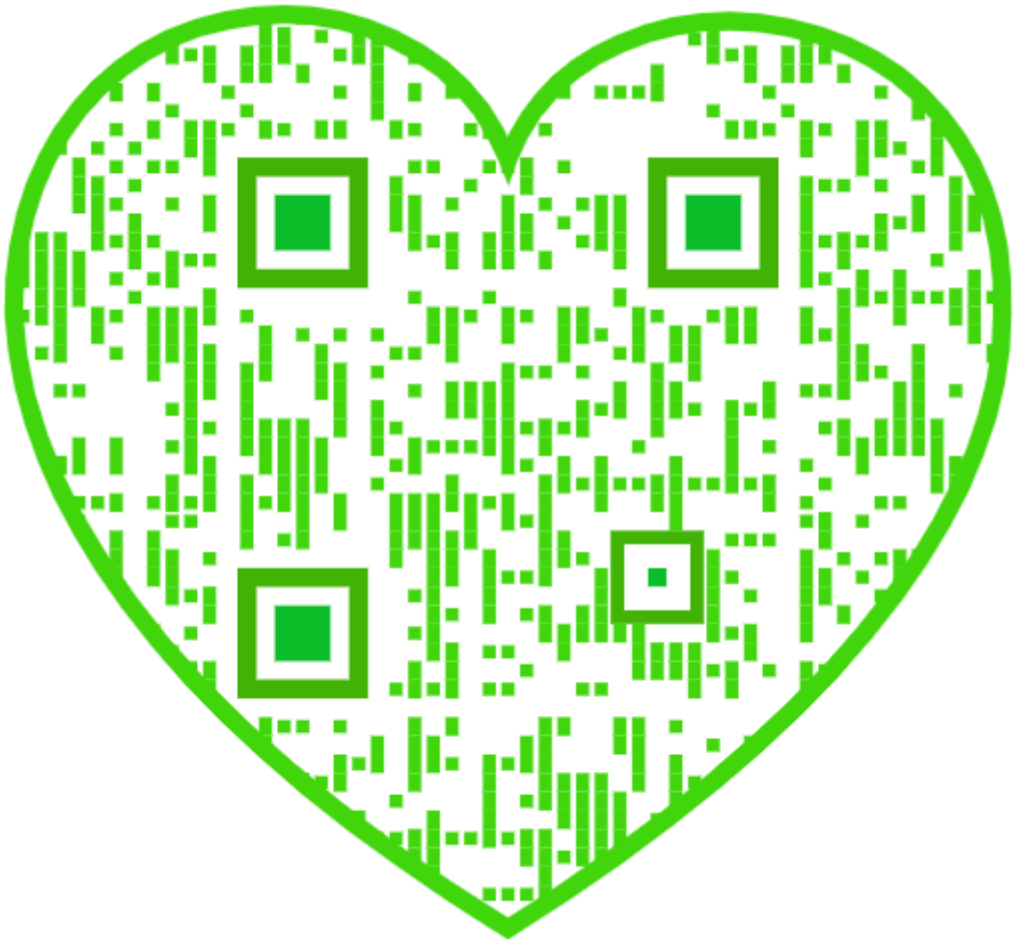

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

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VOL. XXXIX., No. 19. [NEW SERIES.] *Thirty-third Year.*

NEW YORK, SATURDAY, NOVEMBER 9, 1878.

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Depth of Nevada Gold and Silver Mines.

The Sierra Nevada mine is at a depth of 2,200 feet; Ophir, 108 feet on stope below 2,100 feet; Consolidated Virginia and California are 2,050 each; Gould & Curry, 1,900; Savage, 2,300; Hale & Norcross, 2,300; Chollar Potosi, 1,850; Imperial, 2,400; Consolidated, 2,400; Bullion, 2,200; Yellow Jacket, 2,400; Crown Point, 2,360; Belcher, 2,360; Julia, 2,100; North Consolidated, 1,425. Levels in North Consolidated are 1,100 and 1,425 feet from the surface.

THE EAST RIVER BRIDGE.

[Continued from first page.]

At the outset the estimated cost of the bridge, exclusive of the land, was $7,000,000. When at the death of his father, Colonel Roebling, the present engineer in chief, Mr. W. A. Roebling, took charge of the work in 1872, he raised the estimate of cost to from $8,000,000 to $9,500,000. In 1875 the directors asked and obtained an appropriation raising the expected outlay to $13,500,000. Even this vast sum is now found to be insufficient; and the probability is that the amount needed will not be less than the estimate made by the SCIENTIFIC AMERICAN, some five years ago, namely, $20,000,000, a sum nearly double what would be needed—as was shown in this paper February 3, 1877—to provide at least fourteen tunnels crossing under the East River at as many principal streets.

Already the limit fixed by the Legislature has been passed, and yet the work is far from completion As a natural consequence the undertaking has aroused the strenuous opposition of influential parties, who insist that no more of the city's money should be expended on account of the bridge until the courts decide that it must be paid. Prominent in this connection is the New York Council of Reform, whose president, Mr. William H. Webb, the eminent ship builder, has lately given an elaborate statement of the grounds on which their opposition to the bridge has been based. A summary of his argument will be given below. How far the charges against the bridge—on the score of its injury to commerce, its incapacity to meet the needs of the two great cities which it is to unite, and its inability to withstand the force of storms such as that which has just made such havoc along our coast and in neighboring cities—how far these charges are true, how far exaggerations of fact, we shall not now attempt to discuss. We give them as an essential element in the history of the great bridge.

Under the head of injury to commerce, Mr. Webb asserts that two thirds of the 19,534 sea-going vessels that came into this harbor in 1876 had to pass the towers of this bridge, some of them several times, in the process of loading, unloading, and repairing; and that the masts of a large majority of these vessels were found to be too high to pass under the flooring of the bridge under all conditions of weather and the crowded occupation of the river.

The cost and delay of taking down and replacing the top masts, and the frequency of the collisions of ship masts with the cables of the bridge, are said to be so great that it has already become the practice to insert in the charters of vessels coming to this port the conditions that they shall not pass this bridge, or, if compelled to do so, shall receive extra allowance. Since the commerce of this city is its life, and has a State and national importance, no such injury to it can be tolerated.

In view of the circumstance that the United States Government, in the interests of the whole country, is spending many millions in removing the natural obstructions to commerce at Hell Gate (the eastern entrance to New York harbor, on the same channel the bridge is to open), the Council insist that it is not to be supposed that it will neutralize these improvements by imposing a still greater obstruction in the same river by this bridge, especially when such obstructions are expressly prohibited by the laws of this State; and that with so strong a presumption that the bridge will be judiciously condemned, it is a criminal waste to spend any more of the public money upon it, at least until a final decision of this question has been rendered.

Under the head of excessive cost it is urged that, since the act of the Legislature authorized only the construction of such "a bridge as should render the travel of the people of this district certain and safe at all times, and whose cost should not exceed $8,000,000 when completed and open to the public, with all its debts and liabilities paid;" and since the Engineer's estimates show that the bridge cannot be completed for less than double the sum allowed, any further work upon the bridge is unauthorized and illegal, and the further issue of city bonds on account of the bridge should be stayed until some competent judicial authority shall decide that they must be issued.

Touching the incapacity of the bridge to facilitate either passenger or business traffic across the East River, Mr. Webb claims that the bridge will sustain per hour the weight of only 250 passengers in cars and 10,000 moving on foot at the usual rate; while at the busy periods of the day, morning and evening, Fulton Ferry alone carries 20,000 an hour. Seeing that 190,000 passengers are daily carried both ways by all the ferries between New York and Brooklyn, it is claimed that the bridge will not begin to meet the demands that may be made upon it, in case the ferries are suspended by ice or otherwise.

Still more serious is the charge that the bridge will not be secure. Mr. Webb says: "This is wholly an experimental bridge. It is the highest and longest in the world, and probably the only one entirely unsupported by any form of stays. The history of suspension bridges in this country and in Europe shows their most dangerous exposure to be that to storms, producing oscillations and ruptures. Five of the largest suspension bridges in this country, and several in Europe, have been destroyed within a few years after their erection in this manner, although all of them were substantially stayed. The Engineer-in-Chief of this bridge, in his report of March last, asserts: 'During the severe northeast gale of January 31 last it would have been extremely dangerous to have sent trains across on narrow gauge.' This storm, which was not at all exceptional for its violence, Mr. Roebling estimates at 21 pounds per square foot pressure, which is 1-6th greater than the sustaining power of the bridge, and expresses the opinion in this report that a train of cars on either a 4-foot 8-inch track, or 6-foot track, would be upset by a wind pressure 17 per cent less than this, and asks: 'Who can guarantee that the wind will never blow with stronger force?' He instances a recorded case of the velocity of the wind during the last year at 186 miles an hour, or about 170 pounds pressure per square foot. If, then, railroad cars, with their low iron wheels and heavy structure, are liable to be overturned by frequent storms, what must be the liability of top-carriages and business vehicles, with their high wheels, lighter structure, and narrower gauge? What is the liability of foot passengers? What of the bridge itself, with its 130,000 square feet of flooring, and the 17 per cent storm resistance of its trusses? If an eddy of air were to strike the bridge from beneath with greater force than its own weight it would be lifted, to crash back again with its destructive momentum of thousands of tons."

Another source of peril lies in the circumstance that while the bridge will provide space for 5,000 passengers in the car-division and twice as many more on foot, it will bear the weight of only 2,400 at one time, and these equally distributed.

"How are these conditions to be secured in a public bridge 'at all times' when there are at least six hours each day during which, if the ferries are stopped, there will be a pressure for freight and passengers at least ten times greater than the bridge can sustain?"

Again, Mr. Webb urges, the weight and working of the endless rope for propelling the cars is likely to prove a fatal strain upon the bridge. "The iron cable, more than two and one-fourth miles in length, must be of sufficient strength to overcome the friction of the wheels upon which it rests, to carry its own weight, and the car attached to it, at a speed of 15 miles an hour up and down a grade of 100 feet, revolving around drums 6,000 feet apart, and frequently stopping and starting. As this cable is held by drums at each terminus of the bridge, 100 feet lower than it is at the center, when the horizontal power is applied to revolve the cable, it must bear down the center with a crushing perpendicular force."

The feasibility of the method of moving the cars is doubted, Mr. Webb says, by all the best engineers the Council have consulted, while the Engineer-in-Chief of the bridge has condemned the only other method, the use of locomotives, for the reason that the structure has neither been designed nor built to bear such heavy concentrated loads.

In view of these strongly put if not inherently strong objections, Mr. Webb insists that it would be foolish, if not wicked, to spend more money on "a bridge that is not called for, cannot be made to answer the purposes for which it was professedly built, very seriously damages a large part of the commerce of this harbor, taxes the financial ability of these two cities to their utmost, and cannot fail either to be taken down by the mandate of the courts or demolished by the winds."

PROFESSOR MORTON ON THE ELECTRIC LIGHT.

In a lecture before a meeting of the American Gas Light Association, at Stevens Institute, Hoboken, October 17, Professor Morton reviewed the progress made in producing light by electricity, and discussed at some length the question of competition between electricity and gas. In tracing the history of the electric light he said that it is, as applied to practical purposes, essentially a phenomenon of magneto-electricity, or the mechanical production of electricity, because electricity produced by the battery is only used as a matter of scientific interest. In this sense the possibilities of the usefulness of the electric light originated with Faraday's discovery of magneto-electricity in 1831, as everybody knows. This was followed within a year or two by the invention and construction of magneto-electric machines by Saxton, Clark, and others, and these were developed in size and power by Holmes, and by the various inventors whose work is embodied in the machine known as that of the Alliance Company, in Paris, a machine capable of producing a very brilliant electric light, but very bulky and very expensive, requiring immense power to drive it. Its use was consequently limited to the Falmouth lighthouse, in England, and to some French lighthouses and works of construction like the Cherbourg docks.

The first decided improvement upon this machine was made by Siemens, who devised a peculiar form of armature. The next step forward was made by Mr. Wild, of England, who made the remarkable discovery that if a current from a small magneto-electrical machine was made to pass around the coils of a large magnet, the attractive power of that magnet would be immensely greater than the force of the magnets in a small machine. Thus by working a small machine, passing the currents through electro-magnets of a large one, and then taking from the armature of the large machine the current to be used, he obtained great electric power in a small compass. Almost at the same time Wheatstone and Siemens made similar improvements, and a machine, between them and Ladd, of London, received another development by having this curious combination introduced. A single set of electro-magnets were employed, with an armature between the poles wound with two coils, one coil being so connected as to pass the current through the electro-magnet itself, and the other supplying a current for exterior use. In this way the machine, as it were, excited itself, and then yielded a powerful current for exterior work.

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In all the machines used, up to this time, the armature had its magnetism reversed as it rotated, and this involved a great loss and waste of power. The French cabinetmaker, Gramme, conceived the idea of using a ring and rotating this ring between the poles of a magnet in such a way that there should be no reversal of poles, but merely the traveling of the poles around in the ring. This ring was surrounded with poles from which the induced current was taken. The idea here involved was so unpromising that several electricians wrote very decidedly concerning it, opposing and ridiculing it. Nevertheless it produced in practice a machine which possessed a remarkable merit in yielding a large quantity of electricity with a very small expenditure of power. In this country, Mr. Palmer, of Boston, Mr. Wallace, of Ansonia, Mr. Brush, of Cincinnati, Mr. Weston, of Newark, and Mr. Hockhausen, of New York, have all developed machines which involve some of the general principles contained in the earlier productions, and all of which are excellent in their way. By one or other of these machines we are now enabled to produce light by an expenditure of power so small as to render its production cheap; probably not far from a fair average is that of 1,000 candles per horse power. Consequently this light has opened to it a wide field of usefulness and practical application which did not exist when it was more expensive.

Touching the practical uses of the electric light, Professor Morton said that the illuminating of large workshops, of public buildings, places of amusement, gardens, and the like, is undoubtedly an accomplished fact, and this use of the electric light, we feel confident, will largely extend. But it has been suggested that more than this will soon be reached, and that the electric light will take the place of other sources of illumination, gas, for example, in private houses. It would be very foolish for any one to attempt to predict what may or may not be accomplished in the future, but in such a case as this we may at least look back at the past and see what has been the history of the same thing, and judge something of future probabilities from past experiences.

Thereupon the speaker described at length the unfulfilled promises of Mr. Jobart's method of dividing the electric light, which twenty years ago was thought to have solved the great problem of electric lighting. He would by no means have it inferred that better success could never be attained. On the contrary, there are several very promising directions for experiment, on one of which, no doubt, Mr. Edison is at present embarked; but the difference between a promising line of experiment and a successful result all the world's history teaches us is often a distance of many years, to say the least.

The method of producing light by heating a platinum wire by the electric current was then exhibited and explained, and its difficulties enlarged upon. Also the production of light in Geissler tubes, and by the extra current as employed by Professors Houston and Thomson, of Philadelphia, in which direction he thought something might be attained. Of the speedy substitution of the electric light for the gas light, Professor Morton was very skeptical; no such radical change as many expect need be expected this century.

An interesting feature of this lecture was the exhibition of an improved gas burner giving a light of 250 candles with the consumption of forty cubic feet of gas an hour.

THE ELECTRICAL DEPARTMENT IN THE MECHANICS' FAIR, BOSTON, MASS.

At the Mechanics' Fair held four years ago in Boston there were nine entries classed under the head of electrical inventions; to-day there are eighteen. This increase marks the great advance we are making in the application of electricity to the useful arts.

Even in the approach to the exhibition building, which is opposite the Boston and Providence depot, corner of Columbus avenue and Pleasant street, one face is illuminated at night by an electric light, which simulates the white gleam of moonlight, throwing dark shadows and enabling one to see to pick up a pin on the sidewalk with perfect ease.

The illumination of the main building by electricity is the most important feature of the exhibition. One side of the large hall is lighted by five lamps which are run by the Wallace Farmer machine, and the opposite side is lit by four lamps run by the Brush machine. The Wallace Farmer lights are provided with plate carbons two inches by five or six in area. The voltaic arc plays across the smaller side. From three to five lamps are run upon one circuit by the Wallace Farmer machine. If one light should happen to go out, the others in the circuit are not extinguished, for the plate carbons close together and the light is relit. These lights necessarily flicker to a certain extent; they are, however, steadier than would be imagined when the great play of the voltaic arcs in each lamp is considered. It has been demonstrated at the fair that five lights at least can be furnished on one circuit by the Wallace Farmer method. This in itself is a decided achievement.

The Brush lamp makes use of what may be called the pencil carbon points in contradistinction to the Wallace Farmer carbon plates. Each of the Brush machines furnishes four lights, which are fed by four different currents running on two conductors to each lamp. The Brush lights appear to be steadier than the Wallace Farmer lights, but not so powerful. The question of the amount of power used by both machines and the resistances of the circuits of both machines enter, however, in the question of the amount of current generated which produces the lights. The Brush lamp is certainly very steady in its action. The Wallace Farmer lamp and the Brush lamp do not differ in principle with the exception of the use of broad plates by the one and pencils by the other. The carbons of the Brush light are electro-plated with copper, which, it is claimed, prevents the heating of the carbon below the point of burning and regulates the consumption at the points.

We have said that both lamps do not differ in principle. In the Brush lamp the upper carbon is lifted by the movable core of a straight electro-magnet; in the Wallace Farmer by the armature of a horseshoe magnet; and practically the same mechanical device is used in both lamps to prevent the upper carbon from falling when the circuit is made. In the Art Gallery the two rival lamps confront each other, and one can judge better there of the relative brilliancy of the two. The details of the pictures are clearly seen in the brilliant lights, which are softened by heavy ground glass or opal shades. Great interest is manifested in these lights, which seem to be the prominent ones before the American public.

No less than twenty different electrical lamps were exhibited this summer at the Paris Exhibition; and three hundred lamps were lit during the nights of the past summer in the French capital. The Jablochkoff candle has not made its way to this side of the water, and American makers of dynamo-electric machines are attacking the problem of electric lighting by means totally different from those used in France. While we use the continuous current machines the French makers are altering their machines into alternate current machines, so as to obviate the unequal wearing away of the positive and negative carbons. The Jablochkoff candle dispenses with a regulator and thus enables more than one light to be produced by the same alternating current. The American regulators exhibited at the Mechanics' Fair would not work with an alternating machine.

The subject of electric illumination is evidently in its infancy; four years ago, however, the Mechanics' Fair could not have been so satisfactorily lighted as it is every night at the present time by the Brush machines and the Wallace Farmer machines.

The next important invention, and by some considered the most important, is the telephone. Both the Bell telephone and the telephones of the Western Union and Gold and Stock Company are placed on exhibition. The forms of the Bell telephone are well known; both the hand and the box instrument are at the fair, and are connected with the various telephone dispatch companies in and out of Boston, so that one can converse about the fair with one's distant friends. It appears from various trials that a message can be heard better from Cambridge than from a neighboring room in the exhibition building; there is a certain condition of outside resistance beyond the mere resistance of the circuit which seems to give the best effect. In the Gold and Stock Company exhibit can be seen and heard the various forms of Phelps' telephones and also Edison's carbon transmitter. The latter, in combination with a Bell or Phelps telephone, gives the best effect of any telephones or telephonic combinations. It is claimed that the New England Telephone Company (Bell's patent) have succeeded in improving their methods of communication in cities and towns. The same company also exhibit a new and very sensitive call. It is marvelous how quickly a new industry has sprung up with the introduction of the telephone! New forms of flexible telephone cords, provided with binding ends, which obviate the expensive terminals now in use, are exhibited by Mr. Hale, and are practical improvements. Redding & Co. also exhibit enamel covered wire for telephones and electro-magnets in general. Copper wire is coated with a very thin black insulating preparation which is said to stand heat and moisture remarkably well. More turns of this wire can thus be wound upon a given bobbin or magnet than of silk or cotton covered wire.

Edison's electric pen, which is well known to readers of this journal, has a liberal space devoted to it in the exhibition. Many specimens of its work are given, including some fine writing by Edison himself.

An apparatus for lighting street lamps and gas jets in fire engine houses is shown by Mr. Stevens; it seems to be a very practical device, and superior to that which has lately attracted much attention in London. Mr. Stevens makes use of the direct current to turn on the gas, and of the spark produced by the extra current to light it. Many forms of hotel electric annunciators and burglar alarms are exhibited. The exhibition building is protected from fire by the automatic electric fire signal company. The principle of their device consists in the use of a small coil which expands by heat and completes an electric circuit, which thereupon gives an alarm. If electricity could be used to heat the buildings, it could be said to afford in itself both the means of preservation and destruction of the fair.

THE FRENCH INDUSTRIAL EXHIBITION OF 1878.

While the Philadelphia Exhibition was still in progress in the summer of 1876, the French Legislature passed an act providing for the holding of an International Exhibition in Paris in 1878, to continue from May to October.

The preparation of the requisite buildings in the Champ de Mars and on the Trocadero was taken in hand energetically; and notwithstanding the ominous war cloud that seemed to be settling over all Europe, the work of making ready for the Exhibition was pushed forward with commendable dispatch.

A characteristic feature of the scheme was the appropriation of $300,000 for the payment of an International Jury, to consist of 650 members—350 French and 300 foreigners—aided by a Supplementary Jury of 350 members, 150 of whom were to be French.

It was not until the close of last year that the participation of the United States was insured by the passage of a bill appropriating $150,000 for that purpose. At that late date nearly all the space had been allotted, there remaining for the United States only 400 x 100 feet. Fully five times this amount was immediately asked for by our would-be exhibitors, but the vast majority had to be refused.

The Exhibition was formally opened May 1, 1878, though, with the exception of England, few of the exhibits were well advanced toward readiness. Relatively the American space was about one sixth that of Great Britain, one half that taken by Belgium, two thirds that of Austria, a little less than half that of China and Japan, a little more than that of the Netherlands, and about the same as was severally occupied by Russia, Italy, and Switzerland. Germany did not compete.

In view of these facts, the correspondent of the *Tribune* complainingly remarked that he was almost tempted to say that we had better not have come at all than to have come with such a meager display, especially as we might have had as much space as Great Britain if we had asked for it in time.

Thanks, however, to our most efficient and honorable Commissioner in Chief, an admirable selection of exhibits was made; and, as the result shows, the United States partially, at least, made up in quality what we lacked in quantity. In one other respect the Paris Exhibition has been peculiarly gratifying to all Americans: not a question has been raised as to the capacity, energy, and integrity of our official representative.

No official report has reached us with regard to the aggregate attendance upon the Exhibition; we believe, however, that it has been equal to, if it did not exceed, the attendance upon the Centennial Exhibition of 1876.

AWARDS AND HONORS AT PARIS.

The last great official act in connection with the Exhibition of 1878 was the distribution of prizes and honors, which took place Oct. 21, in the Palais de l'Industrie, in the presence of an immense and brilliant audience.

The complete list of the prizes awarded to American exhibitors appears in the SCIENTIFIC SUPPLEMENT of this week; it is happily far too long for insertion here.

The following named Americans received decorations of the Legion of Honor:

Commissioner-General Richard C. McCormick, who is made Commander; Professor F. A. P. Barnard and William W. Story, who were made Officers. Auguste H. Girard, secretary to the Commissioner-General; Henry Pettit, Engineer and Architect of the Commissioner-General's staff; Thomas R. Pickering, Superintendent of the Machinery Section; Lieutenant Benjamin H. Buckingham, U.S.N., Naval Attaché; John D. Philbrick, Superintendent of the Educational Section; D. Maitland Armstrong, Superintendent of the Fine Arts Section; Professor Andrew D. White, LL.D., juror; Professor William P. Blake, juror, and Professor Edward H. Knight, LL.D., juror, were made Chevaliers. Cyrus H. McCormick and Walter A. Wood, who were in 1867 made Chevaliers, have been raised to Officers.

Several exhibitors were made Chevaliers, namely:

Charles Tiffany, silverware; Thomas A. Edison, phonograph; Elisha Gray, telephone; James Brewster, carriages, and F. A. Bridgman, the artist.

It is worthy of note that the men thus selected by the French Government for special distinction are all honored at home as hard working, capable, and useful men—heads of colleges, mechanics, artisans, manufacturers, inventors, artists, scientists, and civil and mechanical engineers.

Though our action was long delayed—indeed, until most foreign competitors had their goods prepared or on the way to Paris—and our exhibitors were far too few in number to adequately represent American industry, yet it is gratifying to note that a larger proportion were prize winners than fell to the share of any other country.

WHO WILL INVENT A SATISFACTORY MILKING MACHINE?

Noting some recent experiments with milking machines, the *Western Rural* remarks that it is safe to say that the milking machines now before the world are not what is needed. They will milk, but not so well as can be done by hand; and failing to get all the milk they tend to dry up the cows. The problem is a difficult one, yet the demand is urgent and the profit assured for any one who will solve it successfully. The *Rural* says:

"No time need be spent in endeavoring to demonstrate the desirability or the necessity of such an invention. This, therefore, existing, we cannot secure the machine too soon. Any opposition to such a contrivance as is needed, which comes of prejudice, should be immediately overcome within ourselves and by ourselves, that no unnecessary impediment shall be placed in the way of success. No stubbornness or 'old fogyism' should prevent us from making a careful examination of existing machines, that their merits or defects may be fully demonstrated, and genius thus shown what has been done and what needs to be done. It would be well if our agricultural societies would hold out large inducements to inventors to enter this field, and it is certainly the duty of dairy associations to do it."

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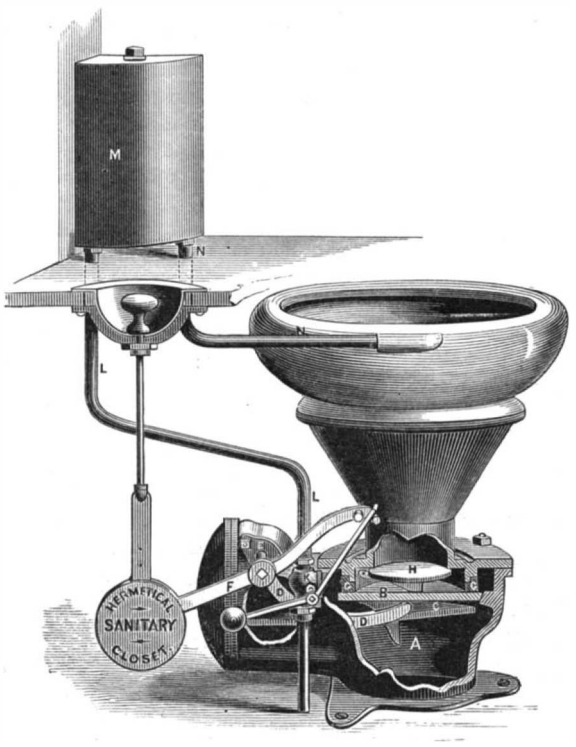
THE HERMETICAL SANITARY CLOSET.

Among the many appliances devised by modern invention to reduce the labor and increase the comfort of our daily life, none can be justly deemed of more importance than the water closet. And yet, of late years, it has become a serious question whether the evils following the introduction of this greatest of household conveniences have not more than balanced its advantages. In many of the fatal cases of diphtheria and typhoid fever, now so alarmingly prevalent, the origin of these maladies has been undeniably traced to the noxious exhalations of sewers and cesspools introduced through the soil pipes of water closets. The S pipe or water trap, on which most of the more expensive closets rely for the increased security claimed for them, has been often shown to be practically as well as scientifically useless.



THE HERMETICAL SANITARY CLOSET.

Even when a copious flushing of the pipes has not completely siphoned out the water in the trap, and given free entrance to the deadly effluvia, it has frequently been observed that a slight pressure of wind or tide at the mouth of the sewer is sufficient to force the gases bubbling through the seal; while, in the absence of any pressure, the water in the trap is constantly absorbing the poisonous vapors with which it is in contact, and giving them off into the air above. Nothing but a metal gate which shall hermetically seal the upper end of the soil pipe can answer the demands, not only of sanitary science, but of common sense; and the only problem for an inventor to solve is how to apply this metal seal in such a way as to be at once convenient in operation, simple in construction, sure in its effect, and reasonably inexpensive. All of these ends are attained by the hermetical sanitary closet shown in the illustration.

A is a valve chamber, with a direct and straight opening into the ordinary trap. B is the gate of the valve, which slides on guides, C, and is provided with anti-friction and non-corrosive slides, operated by the lever and cam, D, on the rock shaft, E, through the outside lever and counterweight, F. The gate, B, when closed, forms a hermetically tight joint against the yielding seat, G, and most effectually prevents the possibility of the escape of any foul or noxious gases. In order to prevent the gate of the valve being fouled by any material coming in contact therewith, the plate or apron, H, is hinged upon the lower part of the hopper and rests upon the gate, falling when the gate is opened and forming a perfect shield. When the gate is closed it raises the apron so as to close the bottom of the hopper, but not so as to make a tight joint, as it is desired so have the after wash rest directly upon the gate, B, thus leaving no air space for the collection of foul gases. When the lever, F, is raised to discharge the contents of the closet, it opens the inlet valve, K, which admits water through the inlet pipe, L, into the reservoir, M. The reservoir is provided with an outlet pipe, N, extending nearly to the top, the pipe, N, being open at the top and having also a small opening near the bottom of the reservoir. The reservoir is rapidly filled with water, which flows through the outlet pipe, N, into the bowl in sufficient quantity to thoroughly cleanse it. The lever, F, is then allowed to fall, which closes the gate, B, apron, H, and inlet valve, K. The reservoir is then left full of water up to the level of the outlet pipe, N; this water flows through the small lower opening in the pipe into the bowl to form the after wash. A small vacuum valve on the top of the reservoir admits air and insures the flow of the after wash.

The distinguishing features of this new sanitary closet are:

The hermetical sealing of the sewer pipe; the absence of air spaces for the collection of noxious odors; the direct passage from the bowl to the sewer connection, avoiding the indirect and circuitous exits; the absolute certainty with which the proper quantity of water for the after wash is secured by the reservoir; the avoidance of spiral springs or other attachments liable to be attacked by rust or impaired by use, and the facility with which it may be operated.

These closets are manufactured by Mr. John S. Leng, and can be seen at his office, No. 4 Fletcher street, New York city.

THE TRIAL OF THE "PYX."

The trial of the legal weight and fineness of the gold and silver coinage struck at the British Mint during the twelve months ending June 30 took place on the 10th of July, before a jury summoned for the purpose from the freemen of the Goldsmiths' Company, this company having supplied jurors for "pyx" trials since the reign of James I. Until recent years these trials were held at very uncertain intervals, and a great hardship was consequently put upon successive Masters of the Mint, in their not being able to obtain speedier acquittances for the very responsible work performed by them; but by an act of the present reign it was provided that such trials shall, for the future, be conducted annually, in such a manner as the Queen by order in Council shall direct. Consequent upon this Her Majesty issued an Order in Council, dated Windsor, the 28th of June, 1871, setting out the mode of procedure to be observed at a trial of this nature, and giving authority to the Lords Commissioners of the Treasury, whenever they should deem it expedient, to issue their warrant appointing a day for holding a trial of the pyx.

An interesting account of the ceremony has been given by the London *Times*, from which the following extracts are taken:

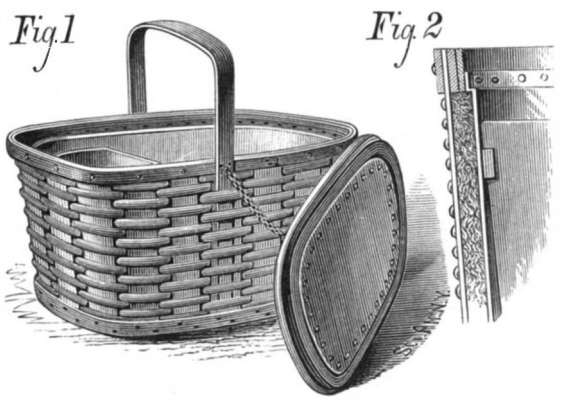
"After all the contents of the pyx have been duly counted the jurors select a few coins of gold and silver to be tested. Each of such coins must be within legal weight. These coins have next to be melted into ingots, and such ingots compared with the pure metals of the standard trial plates, so as to ascertain whether they are within the legal remedy as to fineness. The residue of the gold and silver coins in bulk has also to be weighed, and certain coins taken therefrom and assayed separately. All these processes involve the most minute accuracy and most delicate manipulation by the jurors, who are bound to embody their findings on all these tests in their verdict, which will be published in the next issue of the London *Gazette*."

"The work of the coinage executed at the mint since the previous trial of the pyx took place has not been on a very large scale. £3,246,537 altogether has been struck in gold, out of which 1,579 sovereigns and 3,053 half sovereigns were placed in the pyx. Silver coins to the value of £365,904 were also struck, out of which 626 half crowns, 559 florins, 276 shillings, 290 sixpences, 2 fourpences, 98 threepences, 2 twopences, and 6 pence were placed in the pyx for the purposes of the trial."

"At the hour named by the jurors the Queen's Remembrancer again attended at Goldsmiths' Hall to receive the verdict. In pursuance with the directions of the Order in Council, it was then 'read aloud publicly and in hearing of the jury,' and was authenticated by the signatures of the jurors and the Queen's Remembrancer. The Treasury warrant for the trial being then attached to the verdict, both were taken possession of by the Queen's Remembrancer, to be kept on record in his office. The verdict was, as indeed it invariably has been, most satisfactory, both for the officers of the mint and for the public; and, indeed, shows the most accurate pyx since the new trial plates were made in accordance with the Coinage Act of 1870."

NEW REFRIGERATOR BASKET.

The engraving represents in perspective in Fig. 1, and in section in Fig. 2, a novel refrigerating basket recently patented by Mr. John R. Hare, of 63 W. Fayette street, Baltimore, Md. This basket is designed as a receptacle for meat, butter, fish, and other perishable articles, for transporting and preserving them in hot weather. It may also be employed as a winter dinner basket, as it is as effectual in retaining warmth as it is in excluding it.



HARE'S REFRIGERATOR BASKET.

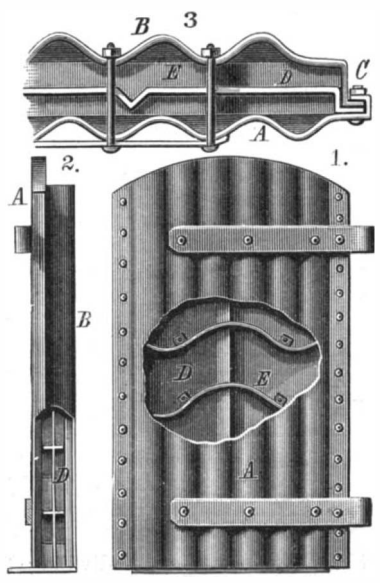
The basket, which is of a substantial character, has an inner wall or lining of tin, between which and the sides and bottom of the basket there is a packing of boiler felt. The lid is lined and packed in a similar way. At one end of the basket there is a removable ice receptacle, which completes the arrangement and makes it in fact a miniature refrigerator. As a lunch basket for picnics or travelers, or as a fishing basket, it must prove of great utility, as the contents of the basket are not only protected from the heat, but from dust and rain as well, and nothing can run out to soil the dress of the person carrying it.

For further particulars address the patentee, as above.

A NEW FIREPROOF SHUTTER.

Next in importance to efficient means for extinguishing fires are the devices for checking its spread. It would be impossible to estimate the annual loss in the cities and larger towns from the spread of fires which might have been checked by the employment of proper means. It is not sufficient to provide portable apparatus capable of general application, although it is good in its place; each building should be provided with some protection which would prevent the communication of fire from without.

We illustrate an improved shutter which, if applied to a building otherwise fireproof, would afford the requisite protection.



POLLOCK'S FIREPROOF SHUTTER.

Fig. 1 is a side elevation, with a portion broken away to show the internal construction; Fig. 2 is an edge view; and Fig. 3 is a horizontal section. A is the outer and B the inner portion of the window shutter, both made of corrugated sheet iron. The inner plate is bent to form a deep flange, C, which is bent outward at right angles. A plain iron plate, D, is interposed between the plates, A and B, as a central partition, dividing the space between them into two equal chambers. It has an edge flange, which is interposed between the flange, C, and the outer plate, A. The edge of the outer plate is bent over the edge of the flange, C, and plate, D, and the three plates are further secured by bolts and rivets. The plate, D, has a central crease parallel with the corrugations in the other plates to allow for expansion by heat. There are upon each side of the central plate, D, several curved strips, E, which maintain the distance between the plates, and prevent them from collapsing.

The corrugations permit the expansion of the plates without injury, and the several compartments formed by the partition and cross strips contain air, which is one of the best non-conductors of heat. This invention was recently patented by Mr. Simon L. Pollock, of St. Paul, Minn., from whom further information may be obtained.

An Odd Craft.

A correspondent, writing from Owen Sound, Ontario, sends us an account of a floating grist mill, or grist-grinding steamboat, now on the stocks at Little Current, Ont. The stern of the craft carries the machinery of an ordinary propeller. The forward part is fitted up as a grist mill, power being supplied by the engine. The intermediate space is to be used for freight, while the upper deck provides accommodations for passengers.

There is a double lack of grist mills and steam communication on and about Manitoulin Island; and the projector of the new craft, Mr. D. Miller, of Little Current, proposes to meet both wants at once. He expects that on receiving due notice of his coming, farmers near the various ports of the island will be ready with their grists; after grinding them he will sail with passengers and freight to the next port, grinding by the way, for his own use, the wheat he has received as tolls. When his steamer is tied up for the winter the capital invested in it will not have to lie idle, for the boat will at once be converted into a grist mill, without change of machinery.

Early Gold Payments.

Since publishing the card of Messrs. Wilcox, Crittenden & Co., relative to their paying their May pay-roll in gold, we have received several communications naming still earlier payments. Mr. J. James, of Pittston, Pa., writes that the Wyoming Valley Knitting Company paid their hands in gold May 15. The Hagerstown (Md.) Agricultural Implement Manufacturing Company give March 18 as the date of their first payment in gold. Mr. Geo. E. Stauffer writes that Messrs. Bennett & Dunk, tanners, of East Stroudsburg, Pa., paid their men in gold on March 15. This is the earliest date, so far as heard from.

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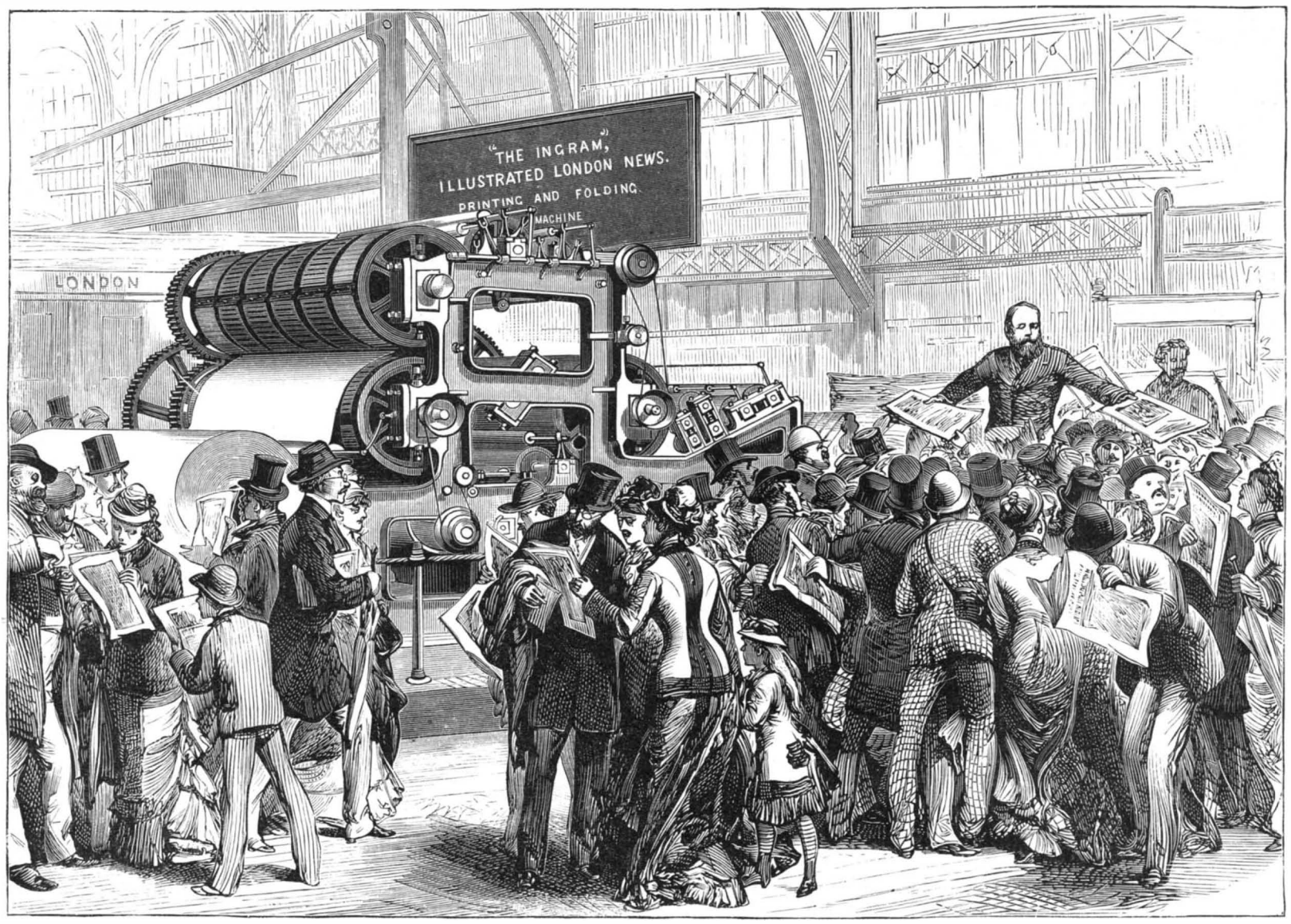
INGRAM ROTARY PRESS AT THE PARIS EXHIBITION.

Class 60 of the Exhibition consists of "Apparatus and The processes used in paper making, dyeing, and printing." British Section contains, among printing machines, one invented by Mr. W. J. Ingram, M.P., managing proprietor of the *Illustrated London News*, for the rapid production of perfected copies of that journal.

"The Ingram Patent Rotary Printing Machine," as it is called in the official catalogue, is the object of much notice among visitors to the Exhibition who care for mechanical appliances. It is the second of its kind that has been made, and has received certain improvements; the printing and impression cylinders are here all of equal size, enabling three whole sheets to be printed at each revolution; or two copies of the half sheet, with a duplicate of the type, may be printed simultaneously by one of the cylinders.

Attached to the printing machine is the folding machine, which can be worked either in company with it or separately, cutting off and folding the sheets as fast as they are printed.

The difficulty formerly experienced in printing, by the action of a cylinder, sheets to be impressed with engravings, has been completely overcome; the diameter of the cylinder is so greatly increased that the plates of engravings require to have but a slight degree of curvature; while two, three, or more duplicate plates may be placed on the same printing cylinder. The "impression cylinder," which carries the paper from a roll of immense length, is made of corresponding size; this brings the paper in contact with the inked type on the "printing cylinder," rotating at the same speed. Another improvement has been made in the inking apparatus of distributing rollers, or cylinders to supply the engravings with ink, which is done so amply and evenly as to render the most perfect impressions on the paper. This machine can deliver 6,500 perfect copies an hour of the *Illustrated London News*, with its supplements, every sheet well printed on both sides, cut-off, and neatly folded. It has been manufactured by Messrs. Middleton & Co., engineers, of Southwark. Mr. James Brister, manager of the machine department in the office of that journal, was intrusted by Mr. Ingram with the practical execution of his design, and superintended the construction of the new machine. A Gold Medal was awarded to Mr. Ingram at Paris for the "Ingram Patent Rotary Printing Machine." We take our illustration from the *London News*.



THE INGRAM ROTARY MACHINE FOR PRINTING ILLUSTRATED NEWSPAPERS.

A Steam Tricycle.

In one of the railway material annexes at Paris is a steam tricycle, having the boiler under the rider's seat, the hind wheels being driven by a cord from the crank shaft pulley. The engine is a tiny cylinder, inclined about 45°. The position of the boiler, which, by the way, is of a rather complicated and inexplicable type, commends itself for winter use.

Workingmen in England and France.

Land and Water, drawing a contrast between the working people of France and England, suggests that the latter would do well to send out a commission to France and inform itself why the people of the latter are more thrifty and have less pauperism than prevails among the English working classes. The writer proceeds to say:

"The French artisan works longer for his weekly earnings than the Englishman. On the average the difference in the number of hours is 27½ per cent, while the wages paid are 25 per cent lower, so that in these two items together the employer in France has an advantage over an English mill owner of more than 52 per cent. On the other hand, a somewhat greater number of hands have to be employed in France than in England for a similar amount of work, and some classes of English work people individually produce more than the same class of French work people; but on the whole, after allowing for these considerations, the best authorities agree that labor in France costs one fourth less than in England; in other words, the earnings of a French operative are 25 per cent less than those of the British workingman. Then are the French artisans in worse circumstances than the English industrial classes? Quite the contrary.

"The most striking fact with regard to the French working classes is that nearly all are possessed of money. However little they earn, they save something. Thrift is their great characteristic; in fact, it is said of the French operatives that they spend less in proportion to their means than any in the world. Many keep their accumulations in an old stocking secreted in their houses; others—a daily increasing number—invest in various securities, the most popular investment being the purchase of land. Every Frenchman, when he can, becomes the owner of the house in which he lives. Of course he is greatly aided in this by the French land laws and laws of inheritance, which cut the whole country up into small holdings. Savings banks with government security, building clubs, sick clubs, and friendly societies are also in favor, but no money is tied up in trades unions. Strikes of course occur, but in some industrial centers they are very rare, as, for instance, in the woolen districts. Some authorities say that the French workmen have not yet felt and do not know their power, and believe that they will ultimately become more difficult to deal with. We doubt this explanation, because politically the French workmen have repeatedly shown that they are alive to the strength which combination gives; they understand that strength, and they have used it, often with sad consequences to themselves; but socially and commercially they have not proved themselves fond of trades unionism, and we believe those are right who tell us that the French workingman is, as a rule, well aware that his interests are bound up with his employer's, and that strikes are suicidal. How many British work people hold consols? In 1874 the number of persons entitled to dividends from the British funds was 228,696; in 1875 the number of holders of French rentes was 4,380,933. Many artisans in France live in their own freehold houses; others rent small houses, or more commonly the flat of a larger house. In some districts rent is about the same as in the manufacturing districts in England; in other parts it is much lower. Butcher's meat is a trifle cheaper, but meat is not, as with us, an article of daily consumption. In the south of France, thanks to the climate and soil, fruit is to be had for very little, and wine is abundant and cheap. Clothing is far cheaper; the blue blouse, the invariable working dress, being very useful, suitable, and inexpensive. All these are points in favor of the French workingman. But then he is paid 25 per cent less than the Englishman, and therefore how is it that he is able to save so much more than the British operative?

"During various inquiries made of late years into the factory laws, eminent witnesses declared that the physique of our operatives is deteriorating; if so, then the ham, eggs, potatoes, spirits, and so forth, in which they more and more indulge, have not been of much use to them. Of course, the great mistake of the English working classes is intemperance; the public house is the sink down which he steadily pours his earnings. In France it is otherwise. French wine, if cheap, is unintoxicating; drunken men are rare, and a drunken woman is seldom seen. But, after all, it may be that the mischievous effects of an ill-administered Poor Law, operating from generation to generation, is more than anything else to be blamed for the want of thrift among our industrial classes. From father to son the traditional maxim goes, 'Why save when there are the rates to fall back on?'"

[The whole secret of the Frenchman's superior thrift may be stated in three words—industry, economy, temperance. —EDS.]

New Artesian Well, Vitoria, Spain.

The new artesian well which is now being bored, under the direction of Mr. Richard, C. E., at Vitoria, Spain, has now reached a depth of nearly 2,200 feet. The diameter of the bore is about 20 inches. The drills are worked by a 32 horse power steam engine. All the machinery is described as being of the most perfect and effective character. It is hoped that one of these days the drills will reach a subterranean river capable of supplying the city with an abundance of the purest water.

A Long Train.

On the Northern Central Railroad of Pennsylvania, lately, engine No. 4 drew from Clark's Ferry to Sunbury, a distance of thirty-one miles, a train consisting of 183 empty freight cars, one loaded eight-wheeler, two cabooses, and a dead engine. It was up-grade work, but the trip was made at the rate of ten miles an hour. The train was 6,200 feet long, or 920 feet more than a mile, and, it is claimed, was the longest ever drawn by a single engine.

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ASTRONOMICAL NOTES.

BY BERLIN H. WRIGHT.

PENN YAN, N. Y., Saturday, November 9, 1878.

The following calculations are adapted to the latitude of New York city, and are expressed in true or clock time, being for the date given in the caption when not otherwise stated:

PLANETS.

	H M.		H.M.
Venus rises	6 10 mo.	Saturn in meridian	8 35 eve.
Mars rises	5 14 mo.	Uranus rises	0 29 mo.
Jupiter sets	9 41 eve.	Neptune in meridian	11 09 eve.

FIRST MAGNITUDE STARS, ETC.

	H.M.		H.M.
Alpheratz in meridian	8 46 eve.	Procyon rises	9 57 eve.
Mira (var.) in meridian	10 56 eve.	Regulus rises	0 05 mo.
Algol (var.) in meridian	11 44 eve.	Spica rises	4 42 mo.
7 stars (Pleiades) in merid.	0 27 mo.	Arcturus sets	6 06 eve.
Aldebaran in meridian	1 16 mo.	Antares sets	5 26 eve.
Capella in meridian	1 54 mo.	Vega sets	0 14 mo.
Rigel rises	8 21 eve.	Altair sets	10 58 eve.
Betelgeuse rises	8 07 eve.	Deneb sets	3 19 mo.
Sirius rises	10 22 eve.	Fomalhaut in meridian	7 35 eve.

REMARKS.

The third magnitude star, *Eta Tauri*, will be occulted by the moon immediately after rising on the evening of November 10. This star is also called "The Light of the Pleiades," being the brightest member of that cluster, and near its center. The star will disappear at the moon's eastern limb, 37° from the north point, and reappear about 90° from the north point toward the west.

Venus is moving eastward among the stars of the constellation *Libra*, and is very near the second magnitude star *a Libra*. Mars is very near the eastern limit of the constellation *Virgo*, being 10° east of *a Virginis* (Spica), and, having an eastward motion nearly equal to the earth's, he rises now at nearly the same time he did one week ago.

The Satellites of Mars.

The authorities of the National Observatory have lately published in pamphlet form Professor Hall's "Observations and Orbits of the Satellites of Mars, with Data for Ephemerides in 1879." As many different accounts of the Professor's discoveries have been given, some of them very wide of the truth, we think that the following condensation from the discoverer's own account, now just published in the above pamphlet, together with such description of the satellites as can be obtained from the observations so far made, will be interesting to our readers:

It appears that in the spring of 1877, the idea of availing himself of the then approaching favorable opposition of the planet Mars struck the Professor as a good opportunity to make a search with the large Clark reflector for a satellite of this planet, but on examination the literature of the planet showed such a mass of observations of various kinds by the most skilled astronomers that the chance of finding a satellite appeared to be so slight that but for the encouragement of his wife the Professor would probably have abandoned the search. But a more thorough examination of the observations showed that hardly any astronomer of note had made any special search for satellites since the time of Herschel. Professor D'Arrest, of Copenhagen, had, however, made a search about 1862 or 1864, but failed to find any satellite, and his failure was a further discouragement to Professor Hall; but remembering the power and excellence of the Clark instrument, he thought there was still a slight chance, and began a thorough search early in August, at which time the geocentric motion of the planet would make the detection of a satellite easy. His attention was first directed to several faint objects at some distance from the planet; but all these proved to be fixed stars, and on August 10 he began to examine the region close to the planet within the glare of the light surrounding it, by sliding the eye piece so as to keep the planet just outside of the field of view and then turning the eye piece so as to pass completely around the planet. This night nothing was discovered, as the satellites were very near the planet, but on the night of the 11th, after several sweeps around the planet, a faint object was discovered that afterward proved to be the outer satellite, but fog from the Potomac prevented any further observation at that time, and it was not until the 16th that the satellite could be seen again, owing to unfavorable weather. On that night sufficient observations were made to show that it was moving with the planet, and on the succeeding night, while the Professor was watching for the outer satellite, the inner one was discovered. The observations of the 17th and 18th put beyond doubt the character of these objects, and the discovery was publicly announced. The peculiar motion of the inner moon puzzled the Professor, as it appeared on different sides of the planet on the same night, which made him think that there were two or three inner moons; but a close observation throughout the nights of August 20 and 21 showed that there was but one inner moon, but that its frequent appearance was caused by its rapid motion around the primary, which is in less than one third the time of the primary's rotation—a case unique in our solar system.

Of the various names proposed by different parties the Professor has chosen those suggested by Mr. Madan, of Eton, England, namely, Deimos for the outer satellite, and Phobos for the inner one, after the names of Mars' chariot horses, or his sons or attendants, as some translators have it.

The Professor gives an exhaustive review of the observations of these minute bodies at the observatories of Washington, Greenwich, Oxford, Cambridge, Glasgow, Paris, Pultowa, and other places, from which it is deduced that Deimos revolves around Mars in 1·262429 mean solar day, and Phobos in 0·3189244 of a day, both moving very nearly in a plane of the equator of Mars. The hourly areocentric motion of Phobos is 47·033°; and on account of its rapid motion and its nearness to the planet, this satellite will present a very singular appearance to any inhabitants of Mars, if such there be. It will rise in the west and set in the east, and will pass the outer moon, whose hourly motion is only 11·882°. The distances of these satellites from the center of Mars are: for Deimos 14,500 miles, and for Phobos 5,800 miles. The semi-diameter of the planet being 2,100 miles, the horizontal parallaxes of these satellites are very large, amounting to 21° for Phobos. The nearness of this satellite to the surface of the planet will produce apparent eccentricities of its motion and cause it to appear as a variable star. Its nearness to its primary will make it the most difficult to see, although the brightest of the two.

The size of the satellites is not well known, although it is certain they are very small. From comparative measurements of their light, Professor Pickering, of Harvard, estimates Deimos to be six miles in diameter and Phobos seven miles, but other observers have been led to place them at from ten to fourteen miles in diameter.

Professor Hall gives considerable data for calculating ephemerides, which will be found useful in facilitating observations of the satellites in 1879, but the matter is too long for the space we have at command, and we must therefore refer our astronomical readers to the pamphlet itself, which may be obtained by sending to the National Observatory at Washington.

CALIFORNIA MINING VS. FARMING.

A conflict of interests has arisen in California between the hydraulic miners and the farmers of the neighboring valleys, in which a most important principle is involved, and which is likely to seriously affect mining interests throughout the West.

In all communities founded on mining interests those interests naturally take precedence of all others, and are, it is well known, pursued without much consideration for any rights that are opposed to their absolute rule. So it has happened that for many years the hydraulic miners, constantly increasing in numbers and in the extent of their operations, have carried on their work regardless of all results but those which should bring profit to them. But, in the meantime, the agricultural interests of the State, which had held a secondary position, have been growing, until now they rank first in importance, and claim to have rights which even mining companies are bound to respect.

The farmers, especially of Sutter and Yuba counties, complain that the rich river bottoms, the most fertile portions of the land, are being ruined by the miners. "The débris from the mines chokes the rivers, raises their beds, diverts their currents, and is spread by the freshets over the alluvial valleys in layers of mud and sand that destroy tillage and cover the fruitful land with barrenness."

The citizens of Sacramento valley have formed themselves into an organization called "The Anti-Débris Association of the Sacramento Valley," and have adopted articles of agreement binding the members to prosecute to final adjudication in the court of last resort any case now pending or that may hereafter be instituted for the purpose of determining the right of miners to use channels of rivers and their tributaries as places of deposit for débris, thereby destroying large bodies of valley land, etc. And these organizations are extending throughout a great portion of the State.

Already the land owners on Bear river have formed a protective society, and have brought suit against the company whose mines the river washes, in behalf of one of their number whose lands have suffered.

The miners are naturally unwilling to give up a long exercised privilege, even though it is destructive to their neighbors' property, and are thoroughly united in defense of their prerogatives. Their organization extends the entire length of the State, and when one mine or company is attacked in the courts the expense of litigation is borne by all of them in proportion to their value; and their capital may be counted by millions.

We quote from one of our contemporaries that: "In the interest of the miners it is urged that they have for thirty years had the right of throwing their tailings into the streams, and that this right is part of the title of every mining claim; so that to take it away is to despoil the miners by wholesale, to destroy many millions of property, and to bankrupt whole counties."

What the law of the case may be the courts will decide; but as far as the permanent interests of the State are concerned, it can hardly be doubted that if it has come to a question between the two, agriculture is more important than mining. It is hard to believe that no way can be found of working the mines profitably without sending the tailings down stream, or that if this were the case the mines could be valuable enough to make their preservation a matter of vital importance. But in any case it is likely that another generation will exhaust the mines, and if in the meanwhile they are allowed to destroy the valleys below them, there will be nothing left worth preserving in the region in question. Under these circumstances few uninterested persons will doubt where the interests of the State lie.

To an outsider, moreover, it would seem that in a State where society is still somewhat inchoate, as in California, it was of no small importance to establish clearly the principle that one industry must not be practiced in such a way as to destroy another.

That the struggle will be a most severe and protracted one is certain, because of the important interests and the wealth involved, but it may reasonably be doubted if the defense of long and unopposed usance urged by the miners will, in the end, prevail.

A decision in favor of the mining corporations would be interpreted as giving to all miners privilege to encroach on other interests; while a contrary decision would encourage, we fear, such widespread litigation on the part of owners of lands anywhere adjacent to mines—for claims for damage will rest on other causes than hydraulic mining—that many valuable mining properties will cease to be worked unless the mining laws are modified for their protection.

PROGRESS OF OUR FOREIGN TRADE.

In answer to inquiries with regard to prospects of foreign trade, a member of the largest dry goods house in this city said, recently, that in consequence of the increasing demand for American goods in England and abroad, English merchants were copying American labels and trade marks, and placing inferior goods upon the market as American products. His house had met this sort of competition in China and in South America, and had received frequent complaints from merchants who had bought such fraudulently marked goods. Their trade with South America and Australia was increasing and very satisfactory. Owing to the poor credit of merchants in Mexico caused by the unsteady government and the wholesale smuggling on the frontier, their trade was not cultivated. The demand for American cotton goods in China was growing, the exports from this port during the last week in September amounting to over $200,000,

A prominent manufacturer said that a considerable part of the recent increase in trade was due to foreign demands. The trade with South America in his class of goods was steadily increasing, and now the markets of that country are largely supplied by America, whereas a few years ago they were almost wholly controlled by English and German houses. In England the American manufacturers of lamps, fixtures, and clocks were meeting with much success, owing to their superior designs and workmanship.

The head of a large furniture house said that the export trade in furniture was constantly increasing. A few years ago not more than three houses in this country shipped to South America; now there are over a hundred, and they have nearly driven out of that market the English, German, and Australian dealers, especially in the chair trade. Business with Australia and other countries was also increasing.

A large dealer in iron and general hardware reported an increasing export demand for American goods. American manufacturers are very popular abroad, and were being largely imitated. The use of American models, and the forgery of American labels, however, would not pay in the long run, he believed, nor would the imitations materially injure the sale of genuine American products.

Explorations in Greenland.

The Danish Government, says *Land and Water*, have published a report from the three gentlemen whom they sent some time ago to explore the land between the colonies of Godthaab and Fredriksthal. The report, dated Fiskenas, August 9, states that the expedition has obtained very valuable results. M. Dalager, who in 1751 had reached the "Gunatak," a mountain which rises out of the ice north of Fredriksthal, reported that far to the east he observed a series of mountain peaks, which he supposed to be the east coast of Greenland, but although this was generally supposed to be an error, the question had not hitherto been solved. An exploring party, under the command of Lieut. Jensen, R.D.N., has now succeeded in reaching these mountains, which were situated about fifty miles from the border of the icefields, after no small amount of suffering. The expedition, consisting of three Danes and one Greenlander, entered the icefields on July 14. On the 24th, the foot of the mountain range, after much suffering, was reached, but all the toil and sufferings of the explorers appeared to have been useless, as it appeared impossible to ascend the mountains, the fog having again become intense. This was followed by a violent gale from southeast, accompanied with heavy falls of snow, which lasted six days, and as provisions and fuel began to run short, and several of the party felt symptoms of snow blindness, notwithstanding the snow spectacles, it was decided to return, when fortunately, on July 31, the weather moderated, and the sky became clear, and on this day the highest mountain was climbed. The height of this mountain was ascertained to be about 5,000 feet above the level of the sea, and on the other side of the mountain ridge the icefields were observed without interruption as far as the eye could see, the plateau apparently gradually rising higher and higher. It is now consequently proved that this mountain ridge is not the east coast of Greenland.

Gold Amalgams.

M. Kazanoff has made several experiments on gold amalgams. It was found that apparently fluid gold amalgams, containing different quantities of gold at ordinary temperatures, on being squeezed through thin leather bags, give as filtrates amalgams containing the same amount of gold; during these experiments amalgams of different concentrations gave filtrates containing 0·126 per cent of gold. These facts show that amalgams filtered through thin leather are similar to solutions of solids in water, the concentration of which chiefly depends on the temperature of the solution.

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How a Good House Should be Built.

Messrs. Duggin & Crossman, well known architects and builders, of this city, publish the following suggestions to persons about to build a city house, the result, as they state, of their own long experience.

Masons' Work.—Sound, hard-burned Haverstraw brick only should be used. Do not economize by using "up-river" or other cheap brands. The rear wall should be carried up two feet above the roof, and coped. Proper outlet through this wall should be left, connected with an extra large head or receiver, to the rain water leader. This avoids the use of the old-fashioned metal gutter, which is very objectionable.

All outside rear brickwork should be oiled and painted, as it thus retains a bright color longer, and a much drier house is thereby insured.

Avoid Sodding and Flower Beds to the Rear Yards.—In place thereof, have the whole surface of the yard covered with artificial stone pavement, on a good bed of concrete. This cement paving is considerably more expensive than sodding, but it effectually prevents the soakage of water from the yards, and thus guarantees a perfectly dry cellar.

Carpenters' and Cabinetmakers' Work.—Double beams, bolted together, should be placed under all cross partitions; and wherever it can be done, the studding of the partitions above should rest on the head of the partition beneath, and thus avoid the inevitable shrinkage that will occur in the beams.

As soon as the beams are placed in position on the walls and thoroughly cross-bridged, and before the brickwork above is started, the common floor should be laid. This protects the work, and acts as an additional brace to the structure.

After the plastering is all completed, and before the wall base and casings to the doors and windows are placed in position, careful levels should be taken on each floor; then, before the finishing floor is laid, the entire surface should be brought to a billiard-table level, by nailing strips, as may be necessary, to the common floor. The finishing floor should always be laid after the wall base and the door and window casings are nailed up. Thick felt or deafening paper should be placed between the common and finishing floors. The finishing flooring should be laid crosswise of the common floor. This counteracts the shrinkage of the plank, and acts as an additional brace to the house.

The window frames should, in all cases, have a partition strip in the boxes, to prevent the clashing of the weights (this very important matter is seldom attended to); noiseless pulleys for the cords should be used. The inside stop-bead should be not less than two inches, and, with inside blinds, three inches wide, so as to give abundance of room for the window shades. See to it that, after the window frames are placed in position, the mason carefully points up with cement all the air holes and spaces around the frames.

Where sliding doors occur in wood partitions, the pockets should, in all cases, be lined with narrow-tongued and grooved boards.

The white pine work should receive one coat of shellac and one coat of paint before being taken to the house. This prevents the seasoned pine absorbing the moisture from the new building. The casings to the doors and windows should be put together by cabinet makers in the factory months before they are required in the house. This permits of the work being thoroughly seasoned, more carefully and neatly executed, and allows the mouldings to be nailed from the back, thus avoiding the objectionable puttying up, always consequent upon the old method of nailing up the mouldings in the building.

The hard wood work or cabinet finish should, in like manner, be prepared months before it is required, so as to enable the finishing to be done in ample time for it to harden and dry. In finishing the hard wood work, shellac should be avoided, as it is a material only for a day and not for all time. The grain of the wood should be first thoroughly filled with an approved filling material. Afterwards the work should have repeated coats of the best copal varnish; this should be allowed to dry thoroughly hard, and afterwards rubbed down with pumice. Portions of the work can be finished with a dead gloss, or be polished to suit the taste. In the finishing of hard wood, temporary effect can be obtained at a trifling cost; but a lasting finish can only be assured by the free use of time, labor, and material, as stated above.

Plumbing and Drainage.—If it be necessary to study economy, save the outlay on any other item in preference to this, the most important work of the building; to secure good plumbing, it is recommended to have it done by day's work and not under contract. By purchasing the best material, employing selected mechanics, applying practical experience and common sense, there need not be any difficulty in securing a system of plumbing and drainage that will guarantee health, instead of, as in very many cases, causing sickness and death.

The drains should be of 6 inch iron pipe, secured to the walls of the cellar, and not placed beneath the cellar floor, as is usually done. This system allows of a more rapid descent to the sewer in the street, guarantees positively air-tight drains, and permits of examination by the occupant of the house, and immediate discovery of any leakage, should it occur. Where earthen drain pipes are placed under the concrete in the cellar, there is danger of invisible bad work, leakage, and consequent escape of foul matter into the earth beneath the concrete, filling the sub-cellar with a polluted atmosphere, and so finding its way into the dwelling portion of the house. The cellar floor should be graded to the lowest point, where should be placed a trapped drain leading to the sewer.

The rain water leader should be connected with the iron drain pipe, and thus act as a ventilator to the drain. The leader should always be of smaller diameter than the drains, so as to prevent the possibility of siphoning the traps of soil pipes.

The foot of all soil and waste pipes should be thoroughly trapped before they enter the drain.

All of the soil and waste pipes should be continued up the full size to about three feet above the roof, and on top of these ventilating pipes should be placed an Emerson exhaust ventilator.

There have been many complicated and so-called safety traps lately introduced; however, the old-fashioned S trap is all-sufficient, if properly applied. The traps to wash-basins, butler's sinks, kitchen sinks, etc., should be not less than two inches in diameter, and have a seal of not less than two inches. These traps should always be placed above the flooring, so that they can be easily got at either for examination or repairs. Where large sized traps are used, and the waste pipes are of proper size and thoroughly ventilated, siphonage is impossible.

The flooring beneath all washbasins, bath tubs, water closets, housemaids' sinks, etc., should always be lined with lead, so as to protect the ceilings below from leakages, should they occur. The waste pipe from this safe pan, as it is called, should in no case be connected with the soil or waste pipes, but should have an independent pipe, carried down to and emptying on the floor of cellar.

The iron waste pipes and drain pipes should have the joints calked with molten lead, thoroughly driven in. All the hot and cold supply pipes should be of not less than AA pipe.

Heating.—One of the most important matters in the warming of a dwelling is the proper arrangement of the hot air pipes, so that the hot air shall be equally distributed throughout the building in such a manner that the use of one register in the house does not deprive another of its proper supply. This can only be done by a careful calculation of the cubic feet of air to be heated in each room. The hot air pipes, commencing at the cellar, should be graduated in size in such a manner that they produce a uniformity of supply throughout.

In regard to the different methods of warming, namely, by steam heating, hot water, or hot air apparatus, there is but little to say. The vast difference in cost will influence the purchaser to a great extent. The hot air furnace is about one quarter the cost of a steam heating apparatus, and therefore more readily meets the wants of the public. In selecting a hot air furnace there is a very great choice as regards healthfulness and effectiveness. It is a settled scientific fact that heat emitted from wrought iron is far more conducive to health than that from cast iron; the latter being of a porous, granular nature. it allows the coal gas to penetrate into the heating chamber and thence into the house. This does not occur in wrought iron, it being of a more compact, fibrous nature. Therefore, it is advisable to use well made wrought iron furnaces.

A very important matter connected with the furnace is the cold air box. This should be of galvanized iron, for the reason that when made of wood the great shrinkage of this material too freely admits impure air from the cellar into same, and thence into the furnace up through the hot air flues and registers into the different apartments of the house. These unpleasant odors are too frequently charged to the furnace, when they really proceed from the defective cold air box.

Furnaces should have self-supplying water cisterns, so as to fill automatically the evaporating pan inside the furnace.

The Condition of Manufacturing Interests in Germany.

The Chamber of Commerce and Industry of Stuttgart has published its yearly report. From this elaborate and useful publication we condense the following statements concerning different industrial branches.

In regard to the manufacture of artificial alizarine, the consumption of the same is stated as exceeding by 50 per cent the largest quantity of the natural article ever produced, amounting to 50,000 pounds of 10 per cent paste a day. Alizarine is to-day by far cheaper than that article ever was while solely manufactured from the root. An advance of 100 per cent on the present price, however, would hardly cause a decrease in consumption.

Sixteen factories, employing 390 men and furnishing about 2,000 pianos a year, are at present devoted to that branch of industry at Stuttgart. Besides, there are four establishments manufacturing the mechanisms, employing sixty hands. There are also four manufacturers of parlor organs, employing 112 men and furnishing about 1,600 instruments a year. Business has been reported as very good for the past year, especially as to exportations to Chili, Brazil and the Island of Java are concerned.

The reports from the iron districts are discouraging. Consumption has, on one hand, decreased considerably, while the opposition made by England, Belgium, France, and America has been growing continually. High taxes, high prices of coal and a lack of skillful and experienced workmen prove a serious obstacle in the way of a prosperous development of the German iron interests.

The manufacturers of German silver and silver plated ware report an improvement in the condition of trade compared with last year. They attribute a great influence in this direction to the protection offered to the manufacturer in devising and offering new designs, by the new trade mark clause of the German patent law.

A reaction of the present deplorable condition of business matters in the United States is shown in the dullness existing in the exportation and manufacture of corsets and linen goods throughout Germany. The gross value of corsets manufactured has decreased considerably, from 10 to 25 per cent having been estimated. England's purchases alone, as an exception, amounted to about 10 per cent more this year than the year previous.

The manufacture of clothing has, in spite of the decrease caused by the opposition of the United States in South American markets, increased considerably. Prices are, however, very much depressed.

The shoe and leather manufacture is threatened with total extinction by the opposition made by the United States. America furnishes a better article at a lower price than it can be produced in Germany. Unless the German government creates a high protective tariff on hides, leather, and manufactured goods, Germany will for the future be unable to compete with American goods in its own markets. Austria even makes quite an opposition in the shoe line in Germany, as wages are much lower there than in the German empire.

Labor in Chicago.

The Chicago *Tribune* lately sent its reporters to investigate the labor market of that city. The foundries, rolling mills, and manufactories of the city were visited in turn, and inquiries were made with regard to the number of hands employed, the number wanted, applications for work, and so on. Of twenty establishments, employing 5,000 men, ten had all the men they wanted, and five wanted more, but could not get them, while the remaining five had very few applications for work. One employer stated that in his line there was not a man in Chicago out of work through necessity. Others believed that any honest man that wanted work could get it for a laborer's wages, $1 to $1.50 per day. Skilled men get from $2 to $3 per day, which gives fair support, considering the low price of the necessaries of life. The *Tribune* is convinced that the clamor of "no work" and "hard times" does not come from men who work and want to work, but from those who ornament the street corners waiting for better times and higher prices.

Jetties Under Water.

General Q. A. Gillmore proposes to improve the ship channel at the entrance of Charleston harbor by means of low jetties. It is known that Charleston bar has changed very little in either location or magnitude within the last hundred years. Measured along its crest line, or line of least depth, the bar is about ten miles long, its average width between the inner and outer eighteen foot curves being about one mile and three fourths. There appear never to have been less than four nor more than six channels over the bar, the greatest depth of water—rarely exceeding thirteen and one half feet at low tide—being sometimes found in one channel and sometimes in another. Between the channels the depth of water along the crest does not exceed three to four feet in many places. The mean rise and fall of tides is five and one tenth feet, and the area of the tidal basin formed by the harbor and its branches is about fifteen square miles. Gen. Gillmore's project contemplates the construction of two jetties of riprap stone resting on a mattress of timber and brush, one springing from Sullivan's Island and the other from Morris Island, located upon converging curved lines, with the convexity turned toward each other, in such manner that their sea ends on the outer slope of the bar will be parallel to each other, and distant apart from one half to five eighths of a mile. The length of the north jetty will be about 9,000 feet, and that of the south jetty a little over 13,000. The distinguishing feature of the project appears to be that the half of each jetty next the shore is kept very low.

The north jetty will have its crest twelve feet below the level of mean low water, where it crosses the Sullivan's Island Channel, while the crest of the south jetty will be fifteen feet below the same level where it crosses the main channel abreast of Morris Island. From these lowest points the jetties rise gradually as they approach the bar, and the sea ends, for a length of 3,000 feet, are carried up to the level of two and a half feet above low water. A considerable volume of water will therefore ebb and flow over the tops of the jetties, and a proportionately less volume will pass out and in between them, the height of the jetties and their distance apart being mutually dependent on each other.

Inventors Needed in England.

At the recent meeting at the English Associated Chambers of Commerce, American improvements and inventions were mentioned as gravely threatening the manufacturing supremacy of the kingdom. The London *Spectator* states the fact and the remedy in plain English, in this way: "The world has discovered it can have too much of Manchester goods. Lancashire must discover a newer tune for Europe and Asia to dance to than sized cotton. If it desire to make a reasonable profit on its growing capital, it must use a little inventiveness, and vary its note."

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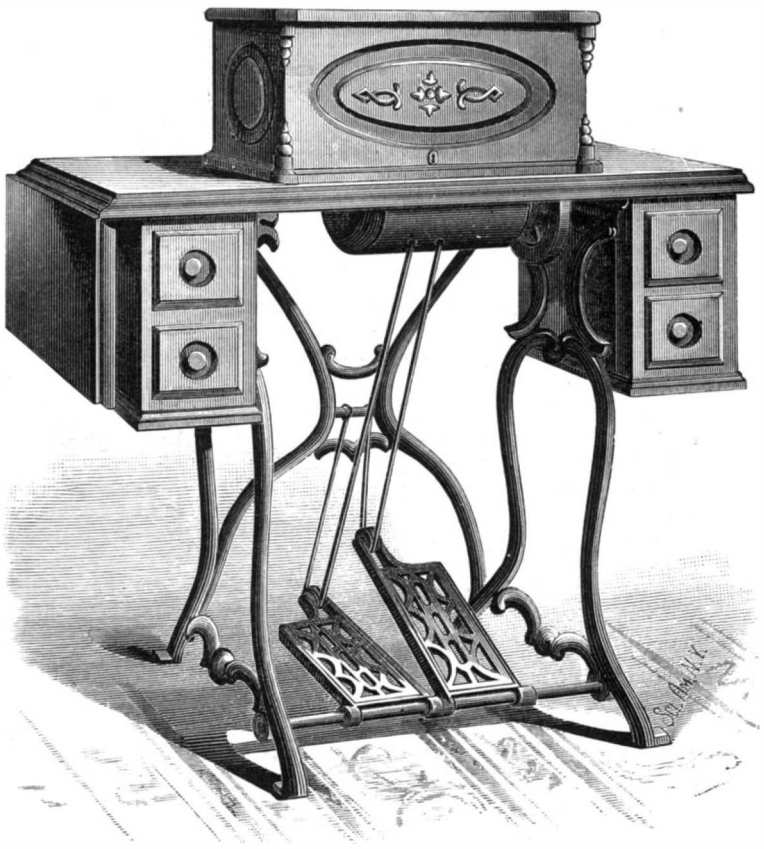
A NEW FOOT POWER.

Foot power is undoubtedly more convenient and economical than any of the motors yet devised for propelling light machines such as sewing machines, lathes, etc., therefore it is important to utilize this power to the best possible advantage.

The accompanying engraving shows the application of one of the best and most recent contrivances for converting the oscillating motion of foot pedals into a continuous rotary motion. In this machine the motion of the two pedals is alternating. The cord which is attached to the frame and extends downward under the pulley on one of the pedals, runs upward over one of the pulleys on the shaft of the sewing machine, over an intermediate pulley, thence over the other pulley on the shaft, and downward around the pulley in the other pedal, thence upward to the frame. The two pulleys, which are placed loosely on the sewing machine shaft, each carry an arm having two pawls that engage a ratchet wheel secured to the sewing machine shaft. There is a separate ratchet wheel for each pulley. A downward movement of one of the pedals rotates one of the pulleys on the sewing machine shaft in one direction and the other in the other direction. The one making the forward movement rotates the machine, while the pawls carried by the other pulley simply make a retrograde movement preparatory to the descent of the other pedal.

The oscillating motion of the pedal is in this manner converted into a continuous rotary movement which must always be in one direction, thus avoiding both the trouble of starting the machine and the possibility of turning it backward. Another important advantage gained by this method of converting motion is that any motion of the pedals, however small, results in turning the machine.

For further information address the patentee, Mr. W. F. Lane, Elgin, Ill.



LANE'S FOOT POWER.

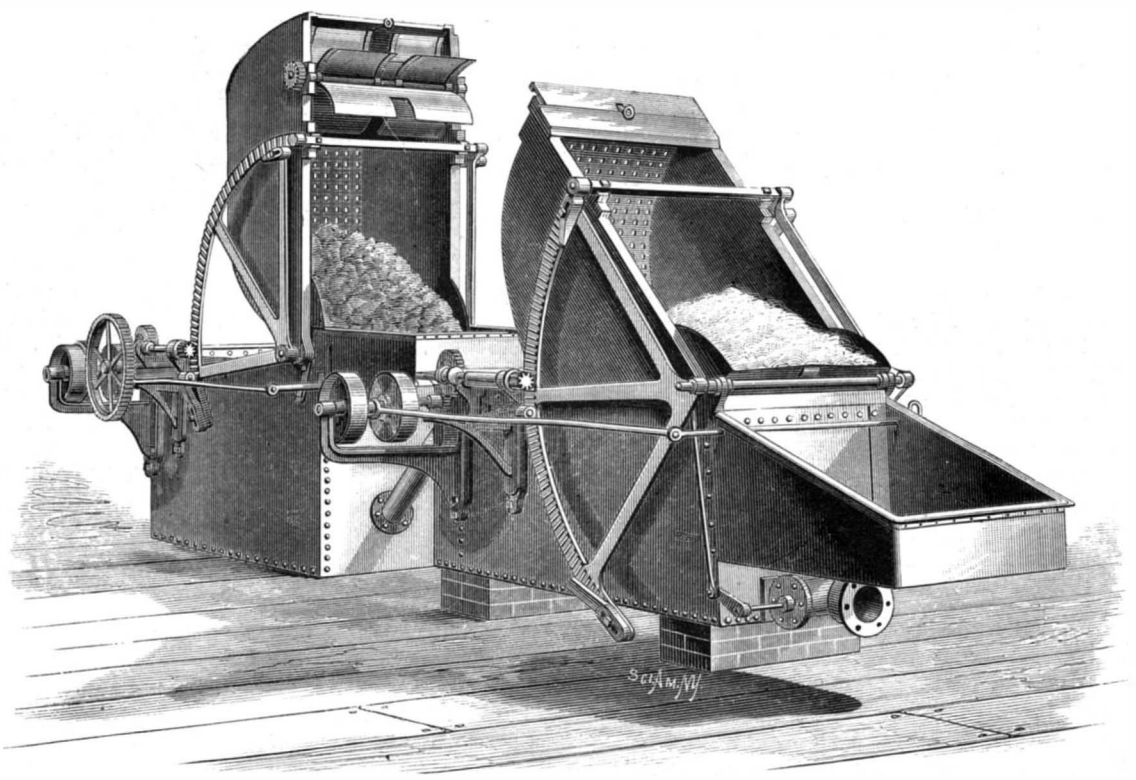
Apples for Europe.

The export of apples this year promises to be the largest ever known. The apple crop is enormous; the quality is excellent, and prices are ruling low enough to give excellent promise of profit in foreign markets. The Boston correspondent of the New York *Bulletin* says that already some vessels have taken as many as 3,000 barrels, but the "Canopus," of the Warren Line, which sailed October 16, took 5,000 barrels, which is the largest cargo yet, and, as near as he can find out, no such shipment was ever before made.

NEW WOOL SCOURING AND RINSING MACHINE.

The usual method of removing wool from the scouring vats is to throw it out by means of forks. By this slow and laborious process it is often difficult to throw it all out, especially if it is short staple wool, and whatever remains in the tank becomes discolored and its fiber loses strength. Besides these disadvantages, the sediment remaining in the vat is stirred up, and the wool in consequence never becomes entirely clean.

In the accompanying engraving a recently patented machine is represented, which accomplishes the scouring and rinsing of wool rapidly and thoroughly, and effects a material saving in labor and scouring materials. In the vat, which is shown in the background, there is an inner vessel, having a rounded perforated bottom, and provided with agitators near the rear end, which keep the scouring liquor constantly in motion. The inner vessel is pivoted at one end, and provided with a circular rack and beveled pinion, by which it may be raised into a vertical position when it is desired to drain the wool and discharge it from the scouring vat.



HALL BROTHERS' WOOL SCOURING AND RINSING MACHINE.

The inner vat is counterbalanced so that it requires little power to move it. As the inner vat is raised the wheels that rotate the agitators are thrown out of gear. The wool is dumped on the drain, which is supported at the front of the scouring tank, and the liquor flows back into the tank, thus avoiding waste.

The rinser, which is similar to the scouring apparatus, receives the wool after scouring. It is kept in motion by a current of water, which is continuously passing through the vat. The stock can be taken out at any time without drawing off the water, by simply raising the inner vessel on its pivot. The water flows back into the vat, and the water gates are closed automatically as the wool is dumped, thus saving water and avoiding the escape of detached bunches of wool with the discharge. The inner vessels are both provided with pawls that retain them at any desired elevation.

We are informed that a number of these machines are in successful operation, effecting a saving of both time and labor, and affording a cleaner product than is possible with the old method of scouring.

For further particulars address Hall Brothers, Norwich, Conn.

New Inventions.

An improved Fishway has been patented by Mr. Marshall McDonald, of Lexington, Va. This invention consists, mainly, in utilizing the head of water for the production, upon an incline, of an upwardly moving current, the head of water being led to the under side of the incline, whence it issues through openings to the surface, which openings are arranged in series and direct the current upwardly, so that an incipient upward current is produced near the bed of the incline, which flows back at such a low velocity as to permit the fish to swim upward in the same, the natural instinct of the fish causing it to swim against the current.

Mr. James Conniff, of Oconto, Wis., has patented an improvement in Logging Sleds which consists of an axle box and attachment made of two horizontal sections, that are bolted to the runner at their ends and to each other at the box part, the box part having an interior rib or thread that is fitted into a corresponding annular groove of the axle.

Messrs. Friedrich W. Hoffmann and Conrad Hoffmann, of New York city, have patented an improved Knife to be used by cigar makers in cutting the wrappers, etc., into proper shape. The blade may be adjusted at any desired angle to the handle, or, when worn, replaced by a new blade, so as to be of greater efficacy and durability.

Frederick Michael, of Eaton, Ohio, has patented an improved Evaporator, which consists, first, in a novel construction of the evaporating pan and arrangement of parts in connection therewith, whereby provision is made for separating the scum from the sirup, and preventing it from being burned, broken, and mixed with the sirup, and for straining the sirup before drawing it from the pan.

Messrs. Eli B. Comly and William C. Brown, of Logan, Ohio, have patented an improved Barrel Cover, which contains a semicircular aperture, covered by a sliding lid, held in place by a screw or bolt, so fixed in reference to the center of the barrel as to allow the lid to be slid around, exposing the aperture without taking more space than the top of the barrel cover. The cover is fastened on the barrel on one side by means of barbs attached to a block fastened securely to the under side of the cover, on the other side by means of a hinge knee joint piercing the inside of the barrel between the chine and the top.

An improved Life Boat has been patented by Mr. Charles Dickenson, of Portland, Or. This invention consists in providing an ordinary ship's boat with an ttach ment in the form of a removable cover or false deck, which, when applied thereto, will convert said boat into a life boat having a chamber in which human beings or goods may be stored, protected, and safely transported to land in case of danger to the ship.

An improvement in Tables has been patented by Mr. Peter Pleines, of New York city. The object of this invention is to furnish for clubhouses and saloons an improved table, in which the shelves below the table are so arranged that the wine and beer glasses may be placed out of the way, and any drippings therefrom conducted off, so that the shelves are kept in a dry and clean state, and may also be more conveniently cleaned of dirt after use.

An improved Cigar Box has been patented by Mr. Moritz Jonas, of New York city. The essential feature of this box consists in its being divisible into equal equilateral triangular spaces so as to receive cigars arranged in triangular packages. These not only allow the article to be exhibited to great advantage, but enable the cigars to be packed quickly and with economy of space.

An improved Paper File has been patented by Mr. Addison Childs, of Ypsilanti, Mich. This invention is intended to provide for families, reading rooms, and libraries an improved paper file or rack, by which the different papers may be quickly and neatly filed in proper order, and one or more readily taken out for use, without allowing the others to fall out; and the invention consists of a base frame hung to the wall, and provided with projecting supporting strips and spring-acted paper holding frames.

Messrs. Thorer Hansen and George H. Weiffenbach, of Racine, Wis., have patented an improved Currier's Knife having reversible blades, which save time in sharpening, as both edges may be worn dull before it becomes necessary to sharpen the knife. The blades are removable, and they are the only portions requiring to be made of steel. There are no screws to wear out or corrode, and the knife is easily cleansed and kept in order, and will thus remain true.

Mr. Edward Kelley, of Baby's Point, Ontario, Canada, has recently patented an improvement in Hair Pins, which consists in connecting ordinary hair pins in pairs by means of an elastic cord of suitable length. The pins are inserted in opposite or nearly opposite sides of the hair braid, with the elastic connection passing over the top of the braids, or around and between the braids, so as not to be exposed to view.

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WASHINGTON MEMORIALS IN NORTHAMPTONSHIRE.

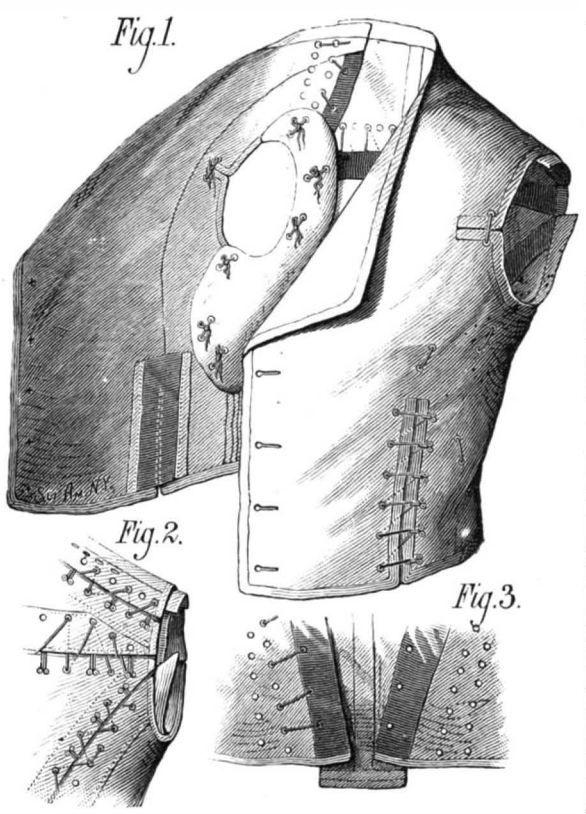
Of all the places of interest visited by the Royal Archæological Institute on the occasion of its recent visit to Northampton, few could have presented more points of attraction than the tombs and other memorials of the Washington family, still to be seen at Brington, about six miles from that town.

In the year 1532, and again in 1546, there was a Lawrence Washington, Mayor of Northampton. He was the son of John Washington, of Warton, Lancashire, and a member of Gray's Inn; afterward, however, he relinquished the profession of the law and settled in Northampton, where he rose to great influence. His uncle was Sir Thomas Kitson, a merchant of London, whose daughter had been espoused by Sir John Spencer, of Althorp. In 1539 he obtained a grant of the manor and lands of Sulgrave, North Hants, together with other estates, which until then had belonged to the Monastery of St. Andrew's at Northampton. Retiring to Sulgrave, he there died at a ripe old age. Three generations of Washingtons only retained possession of Sulgrave, the grandson of the grantee being obliged to sell it and retire to Brington, where he would be under the protection of his kinsmen the Spencers. The house in Little Brington is still shown where he is supposed to have lived. Over the door is the inscription: "The Lord giveth, the Lord taketh away: Blessed be the name of the Lord. Constrvcta 1606."

The parish register, among other Washington records, contains notices of the baptism and burial of a son of this Lawrence Washington in 1606–7. The latter died in 1616, and his remains lie buried in the chancel of the parish church. One of our illustrations represents the shield bearing his arms, impaled with those of his wife, engraven on his tombstone. Near to him, but in the nave, is the grave of his brother Robert. It also bears a shield on brass, showing the same blazon (argent two bars gules; in chief three mullets of the second), with the crescent of a younger brother. This shield, of which we also give a sketch, exhibits even more plainly than the other the characteristics which have caused the device to be regarded as the origin of the American flag, namely, the five pointed stars and the alternate red and white stripes. Robert Washington died without issue. Lawrence, however, had a large family. The first son was Sir William Washington, of Packington, Leicestershire, who wedded a sister of the Duke of Buckingham, through whose influence the fortunes of the family seem to have revived. The second was Sir John. Repeated mention is made of him in the household books of Althorp, where he and several of his brothers were frequent guests. He was married to a daughter of Philip Curtis, of Islip, North Hants, by whom he had three sons. A mural tablet to her memory still exists in the Islip church. Little is known of Sir John, save that he appears, like the other Washingtons, to have taken the side of the king in the civil wars, and that he was concerned, along with a younger brother Lawrence, in the troubles of 1656, and so with him obliged to take refuge in Virginia. Before his emigration he lived some time at South Cave in Yorkshire, where he had acquired an estate. Emigrating about the year 1657 he settled at Bridge's Creek, Westmoreland County, and, marrying again, became the great-grandfather of President Washington. In the red and white bars and the stars of his shield, and the "eagle issuant" of his crest--borne later by General Washington—the framers of the Constitution undoubtedly, too, got the idea of the stars and stripes and the spread eagle of the national emblem. We take our illustration from the London *Graphic*.

A NEW MEASURING JACKET.

In cutting out dress and frock coats by the ordinary methods it is usual to take the breast and waist measures of



LINGEN'S MEASURING JACKET.

the person to be fitted, and from these measurements, and such others as the cutter may be able to make, the body of the coat is cut out. As these measures are, to a great extent, indefinite, it is necessary to try on the garment with the seams basted together, and fit it to the person by altering the seams. This process is often troublesome and unreliable.

The measuring jacket shown in the accompanying engraving is designed to obviate the difficulties common to the usual methods of measuring and to afford a quick and reliable means for taking measurements for garments. Fig. 1 in the engraving is a perspective view of the complete jacket; Fig. 2 is a detail view of the shoulder seams; and Fig. 3 shows the back seams. The jacket is made from corduroy or similar material that will cling to the body, but will not stretch. The seams, instead of being sewed as usual, are connected by elastic cords, which pass through eyelet holes along the edges of the seams.

Each seam is backed by a piece of black cloth, which is attached to one side and overlaps the seam. Hooks are attached to the elastic cords that pass through the eyelet holes of the back and shoulder seams. The jacket is provided with pads such as are used in coats to fill out the hollows of the body at the front of the armpits. These pads are connected with the jacket by non-elastic cords, which retain them in place while the other portions of the jacket are allowed to yield.

The elastic seams and cuts allow the jacket to expand so as to fit the body. If the jacket is too large it may be contracted by means of the hooks and the extra rows of eyelet holes. The amount of opening of the seams may be marked on the black flaps, or a note may be made of it. These changes in the form of the jacket being carefully recorded, the original pattern of the jacket may be laid upon the cloth, and the garment cut according to the variation from the pattern.

For further information address the inventor, Mr. Hermann Lingen, of Wheeling, West Va.

Adulterated Graham Flour.

Graham flour is rapidly coming to be as much an article of suspicion as ground coffee or spices, or any other of the thousand and one articles so frequently adulterated. The commonest form in which Graham flour is seen is that made from a medium or poor class wheat, and while not properly adulteration, it may be justly characterized as swindling of the meanest kind, for the reason that the product is largely used by dyspeptics and others in imperfect health.

The miller who palms off on his customers Graham flour made from anything but the choicest of wheat is one of the meanest of all villains, and if he is not aware of it, should be told so. Graham flour, properly made, is nearly as costly an article as bolted flour ground from the same wheat, and, therefore, when you are offered Graham at much less than

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WASHINGTON MEMORIALS NEAR NORTHAMPTON.

1 and 4. Inscription and Shield of one of Washington's Ancestors in Brington Church, Northamptonshire, the Shield showing the supposed Original of the "Stars and Stripes."—2. House at Little Brington formerly occupied by Washington's Ancestors.—3. Brington Church, containing the Graves of Lawrence Washington and Robert Washington, Direct Ancestors of President Washington.

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the best bolted flour, you are being victimized—it is either adulterated or it is made from inferior wheat. A common form of adulteration, and one that is practiced by at least one retail flour dealer in this city, is to take a barrel of flour costing about five dollars, add to it about sixty pounds of bran, twenty-five pounds middlings, and the same quantity of corn meal. The result of the mixture is three hundred and six pounds of stuff costing about six dollars and forty-five cents, or a fraction over two cents a pound; while Graham flour, made from the best wheat, cannot be sold now at less than three and one half to four cents a pound. And yet this vile stuff is being swallowed by people in search of better health, when they would do about as well on a diet of hot white biscuit.—*St. Louis Trade Journal.*

How the Capitol at Albany, N. Y., is to be Warmed and Ventilated.

The contract for heating and ventilating the Capitol building at Albany has been given to F. Tudor & Co., ventilating engineers, of Boston, Mass.

The space to be provided for is 300 by 400 feet, 100 feet high, and the cost of the system is to be about $30,000. The engineer in the basement will have entire control of the atmosphere of the building, and will be supplied with indicators showing the temperature of every room in the edifice, and in the case of the two large assembly rooms the temperature of different parts of the rooms. After being drawn over the boilers by two 8 foot 3 ton exhaust fans, the air supply passes through two steam coils having a surface of 10,000 square feet each. Thence it goes to a chamber where it is mixed with cold air until the requisite temperature is attained, when it is caught into the blowers for distribution through large zinc tubes. By a movement of the damper determining the flow of hot and cold air to the mixing chamber, an even temperature will be secured. The system will be operated by six 54 horse power steel boilers, built by Hodge, of East Boston, with a 35 horse power Buckeye condensing engine to work the fans. The engine will have a 14 inch cylinder, 28 inch stroke, and will run at 15 pounds pressure. As an offset to the cooling surfaces of the many 5 by 15 windows, pipes are run behind the mop boards, and will throw up from regular vents radiations from live steam.

What a Pe fect Railway Brake Should Do.

The series of experiments with continuous railway brakes lately conducted by Capt. Douglas Galton, on the Brighton (Eng.) Railway, resulted in the establishment of definite conclusions upon several points of practice hitherto in dispute. The conditions of the greatest efficiency in a brake he finds to be few in number. A perfect brake must be capable of instantaneous application with all the force which it can exert, the blocks closing upon the wheels in immediate response to the turning of an easily moving handle by the driver. For trains at high speed—that is, for the ordinary express rates of fifty or sixty miles an hour—the force thus instantaneously exerted must amount to quite double the pressure of the wheels upon the rails. The greatest retardation is produced when the wheels are revolving, but at a rate less than that which would correspond with the rate of movement of the train; and as soon as the wheels are skidded the train glides onward with diminished resistance, and, therefore, goes further than it would have done if they had continued slowly to revolve. Hence it follows that skidding must be prevented; and the difficulty of doing this depends upon the fact that the wheels are skidded more and more easily as their speed of rotation diminishes, so that, with any considerable pressure, ultimate skidding is a matter of certainty. Hence it has been found that the pressure ought to be diminished in the same ratio as the speed, so that the wheels may always be under the dominion of a force sufficient to restrain their motion, but not sufficient to arrest it. It is only by a combination of high initial pressure with a device for steadily reducing it that stoppage within the shortest possible distance can be obtained; and it is manifest that distance, and not time, is the condition by which the efficiency of a brake must be measured. A brake which will stop a train in fifteen seconds, and in one hundred yards, is far better, considered as a source of safety against collisions, than one which will stop the train in ten seconds, but will allow it in that time to run one hundred and fifty yards. If we conceive the obstacle to be one hundred yards from the point at which the brake was applied by the driver, the superiority of the distance to the time standard becomes plainly manifest.

The Secret of It.

At the American Institute Fair an inventor distributes a circular descriptive of a "noiseless rail," in which it is stated that "the wire filled rails have the advantage on raised ground, where the rail road going up, have no difficulty, on account the crevices in the wire are filled with sand and dust by nature on account to be exposed, if the wheels are dovetailed the same way, like the rails, combined together, they will make no noise at all." The inventor further states that a dovetailed groove "filled with pasteboard, rubber, leather, lead, or soft tough steel wire, pressed or hammered in, on the top, on any matter of non-conducting noise will take away the rattling noise." If any one doubts the proposition, we suggest that he test it experimentally.

Florida Ship Canal.

Among the most recent of the many plans suggested by the constantly growing need of the Mississippi valley and the farther West for cheaper transportation of their products to the Atlantic seaboard, is the revival of the old plan of building a ship canal across the State of Florida, or rather across the peninsula of Matanzas Inlet, on the Atlantic, to Fort Wool or Clay Landing, on the Suwanee river. It is claimed that not more than seventy-five miles of canal would have to be cut on this route, that it would have an excellent harbor at each end, and that the whole route would be well supplied with natural feeders. It would make the distance between New Orleans and New York from 1,000 to 1,200 miles less than the track now sailed over, and would, it is claimed, save, yearly, $5,000,000, in the way of shipwrecks, and $3,000,000, annually, in the way of extra insurance; over $40,000,000 in freight, and several millions every year in the way of grain and other products which go to waste in the Mississippi valley for want of cheaper transportation.

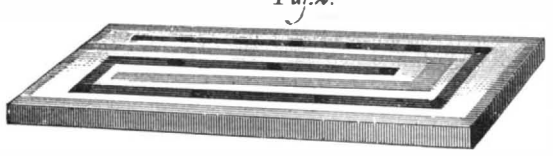
The canal, when built, would, it is calculated, bring in an annual revenue of from $8,000,000 to $10,000,000, and much more when the Darien Canal is completed, as it would throw a vast amount of shipping from California, Japan, and China through the Gulf of Mexico and through the Florida Canal to New York, Liverpool and other ports.

The connection of the Pacific and the Gulf by canal would render this project worthy of further consideration.

A NEW RHEOSTAT.

Last May I invented a new rheostat, which can be used for the Faradic as well as the continuous current. It recommends itself for simplicity, durability, and cheapness. A line of plumbago of variable length is the only means for the resistance.

Fig. 2.

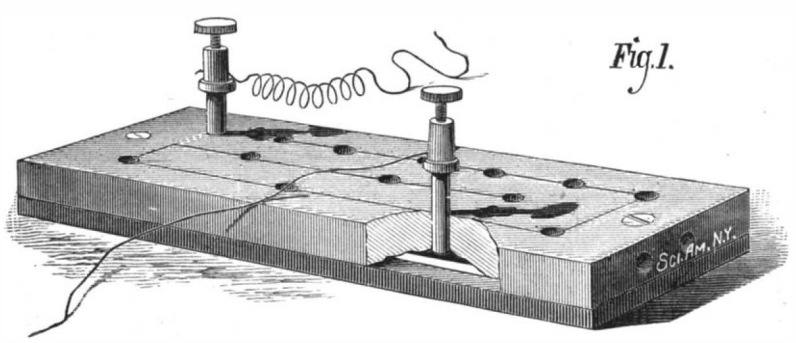


LOWER HALF OF RHEOSTAT.

For the construction of the instrument the following few articles are required: A small quantity of plumbago, a piece of paper, two binding screws terminating in a wire of one inch length and $\frac{3}{16}$ inch thickness, two boards 6 by 2½, one of them ½ inch, the other ¼ inch thick, two common screws, and shellac varnish.

To make the rheostat: Lay out the thicker board, as shown in Fig. 1. The upper line should be 4½ inches long, the others proportionally; this should be divided into six equal parts, and the remaining four lines into seven; each section of the latter being double the length of one of the former. Bore holes through the board on the dividing points indicated, large enough for the end of the binding screws to fit easily, not loosely. Glue a piece of writing paper on the thinner board, adjust the perforated board over it, and press with the wire end of the binding screw slight impressions on the paper through the holes. Cover the end of a small stick or match stump with a strip of soft leather ⅛ inch wide, moisten it slightly, dip it in the best powdered plumbago (stove blacking), and connect the marks on the paper by a line of the blacking, as indicated in Fig. 2. Pass over the lines several times with the plumbago, so as to make a dark, continuous, smooth line of about ⅛ inch in width. Blow off all loose particles. Shellac all parts except the black lines, and screw the thin board on the thick one. The rheostat is now completed. When not in use, it should be kept face downward to prevent dust from entering.

Fig. 1.



DR. OEHME'S RHEOSTAT.

This rheostat has over 20,000 ohms resistance, but if the black line should be made broader, it would, of course, offer less resistance, and *vice versa.* F. G. OEHME, M.D.

Tompkinsville, Staten Island, N. Y.

Additions to Our List of Food Fish.

The work of the United States Fish Commission during the past season has been eminently successful, from a practical as well as a scientific point of view. One of the great advantages derived from making Gloucester, Mass., the headquarters of the commission, arose from the interest awakened among the fishermen of that port. Thanks largely to their collections there have been added to the fauna of the United States, within the last twelve months, by the commission, no less than 19 species, all coming from the vicinity of Cape Ann. Perhaps, during the last fifty years, there has not been made such a large addition to science. Of these, five have been described by Messrs. Goode and Bean as quite new, namely, the *Macrurus Bairdii*, *Lycodes Verillii*, *Haloporphyrus viola*, *Phycis Chesteri*, and *Chimæra plumbia*, with some others, not yet classed or described. There are 14 forms which occur on the coast of Greenland, Northern Europe, or in the deep seas off Madeira, and in the Central Atlantic, which have been taken in the waters near and around Cape Ann. To better understand the scope of the work done, it may be stated that the investigations of the Fish Commission have doubled the catalogue of fish, as printed in the standard book of Massachusetts, published as late as 1868.

The addition of the beam and trawl to the apparatus of American fishermen has resulted in the important discovery of two fish which promise to add largely to the food supply of the country. One of these, the craig or pole flounder (*Glyptocephalus cynoglossus*), an excellent table fish, may now be caught in great abundance in certain depths of water, where its presence was before never even suspected by the fishermen. The black turbot (*Reinhartius pinguis*), the only substitute for the English turbot we have in North American waters, has been found to exist on the outer slopes of the banks north of the Georges. It was believed, before the commission worked out this fact, that the black turbot was never caught south of Newfoundland, and then only in winter. It now is quite certain that this excellent fish can be captured the whole season round in American waters.

New Mechanical Inventions.

Mr. John F. Seymour, of New York city, has patented an improved Attachment for Printing Presses for gumming the backs of sheets of postage stamps, revenue stamps, etc., to lessen the labor and cost of manufacturing stamps. It is effective and will do its work rapidly and well.

Mr. John B. Candy, of Trenton, N. J., has patented an improved Attachment to Lathes for Cutting Rubber and other Rings. This invention consists in the employment, in connection with a lathe, of a ratchet and pawl operated by the motion of the tool rest, whereby the slide that carries the tool rest is caused to travel the exact distance required after each cut. The attachment is provided with means for adjusting the connections to the ratchet and pawl mechanism, whereby the distance traveled by the slide, and consequently the width of the rings cut off, is regulated.

Messrs. James B. Winchell and Joseph W. Häuser, of St. Joseph, Mich., have patented an improved Vehicle Sand Band, consisting of a cap attached to the inner end of the hub, and having two flanges, of which the outer flange has an annular seat for receiving a collar section of the axle, having circumferential rim, flange, and smaller collar, so as to form an intimate contact joint of cap and axle collar.

Mr. Joseph A. Hodel, of Cumberland, Md., has patented an improved Apparatus for Forming Valve Yokes for Steam Engines. In manufacturing these yokes heretofore their weight had to be sustained by the workman while manipulating the same into its perfect form, and as the valve yoke of the locomotive engine ordinarily used weighs about eighty pounds, the operations of forging and welding involved much hard labor. This invention consists in a device for forming these yokes accurately and without laborious handling.

Mr. Eric O. Leermo, of Gold Hill, Nev., has patented an improved Suction Pipe, provided with a number of short branch or T pipes at intervals along its length, which is used in connection with a socket head that supports the pipe, so that any one of said branches may connect with the pipe from the pump, according to the length desired, and the suction pipe may be swung on said connection or disconnected and raised when blasting is to be done.

An improvement in Steam or Air Brakes has been patented by Mr. Marshall Wood, of Alderson, W. Va. The object of this invention is to furnish an improved mechanism for connecting the brakes of the several cars of a train, so that all the brakes may be applied at the same time by the engineer while in his place upon the engine. It is quite simple in construction.

An improved Bit Brace has been patented by Mr. Edward C. Merryman, of Monkton, Md. The object of this invention is to construct a bit brace that may be used for turning bits, taps, and similar tools, and may also be used as a wrench for turning nuts.

Mr. Auguste Beyer, of Paris, France, has patented an improved Machine for Grinding and Mixing Soap, Chocolate, and other pasty substances, in which revolving rolls, having different velocities and disposed so as to convey the pasty mass simultaneously with the grinding and mixing either back in the feed hopper or into an adjacent machine of similar construction, or into a machine for compressing and moulding the mass, the improved machine saving the time and labor hitherto required in common mixing machines for conveying the mass either into the hopper of the same machine for a second passage or to the next machine.

Mr. John T. Fry, of Brooklyn, Iowa, has patented an improved Rotary Churn. It has a hollow cone dasher provided with wings or buckets, also a dasher shaft and suitable driving mechanism.

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THE UMBRELLA BIRD.

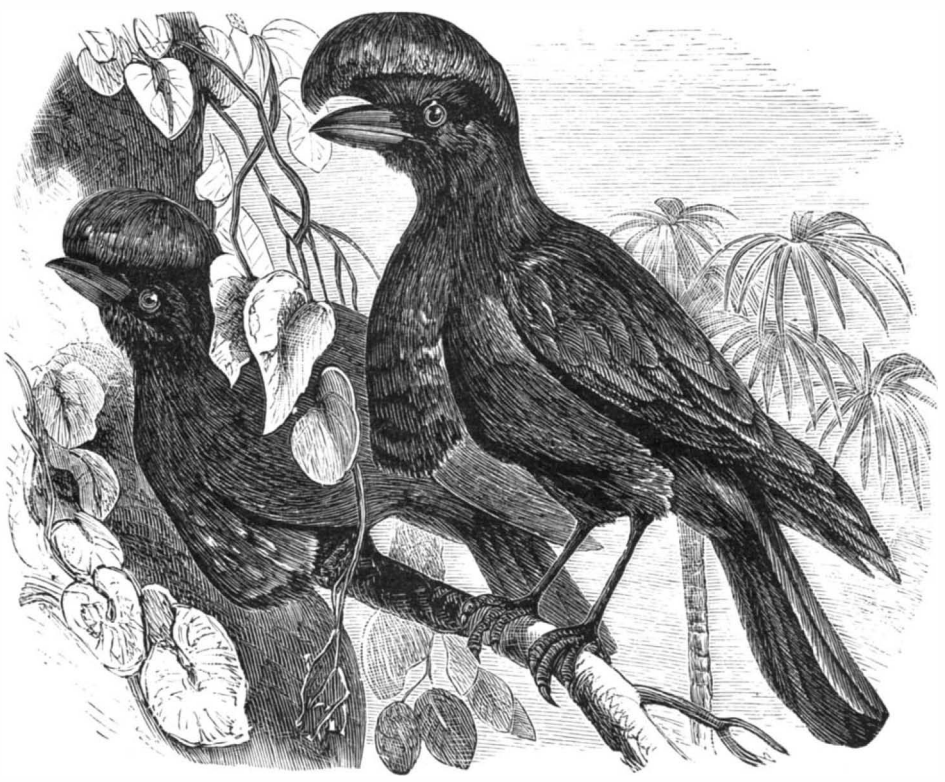
The group of the fruit crows may lay claim to the credit of reckoning among their number one of the most singular of the feathered tribe. The Umbrella Bird is a truly remarkable creature, and from the extraordinary mode in which its plumage is arranged, never fails of attracting the attention of the most casual spectator.

The bird is a native of the islands of the South American rivers—being seldom if ever seen on the main land—from whence it is not unfrequently brought by collectors, as there is always a ready sale for its skin, either to serve as an ornament in glass cases, or as a specimen for a museum. In dimensions the Umbrella Bird equals the common crow of England, and but for the curious plume which adorns its head, and the tuft which hangs from its breast, might be mistaken at a distance for that bird. The general color of this species is rich shining black, glazed with varying tints of blue and purple like the feathers of the magpie's tail.

Very little is known of the habits of the bird; but a very good description of its appearance when living has been given by Mr. Wallace in the following words: "Its crest is, perhaps, the most fully developed and beautiful of any bird known. It is composed of long slender feathers, rising from a contractile skin on the top of the head. The shafts are white, and the plume glossy blue, hair-like, and curved outward at the tip. When the crest is laid back, the shafts form a compact white mass, sloping up from the top of the head, and surmounted by the dense hairy plumes. Even in this position it is not an inelegant crest, but it is, when it is fully spread, that its peculiar character is developed. The shafts then radiate on all sides from the top of the head, reaching in front beyond and below the tip of the beak, which is completely hidden from view. The top then forms a perfect, slightly elongated dome, of a beautiful shining blue color, having a point of divergence rather behind the center, like that in the human head. The length of this dome from front to back is about five inches, the breadth four to four and a half inches."

Scarcely less curious than the "umbrella," as this overhanging plume is very appropriately named, is a bunch of elongated feathers that hang from the breast in a tuft, perfectly distinct from the rest of the plumage. The peculiarity in this tuft is, that the feathers of which it is composed do not grow from the neck, but from a cylindrical fleshy growth, about as thick as an ordinary goosequill, and an inch and a half long. The whole of this curious appendage is covered with feathers, so that the breast tuft is wholly distinct from the feathers of the neck and breast. The entire skin of the neck is extremely loose, more so than in any other bird, according to Mr. Wallace. The feathers of this tuft are edged with a beautiful and resplendent blue, and lap over each other like so many scales. The food of the Umbrella Bird consists chiefly of berries and various fruits, and it always rejects the hard stone of stone fruit. As its cry is extremely loud and deep, the natives call the bird by a name which signifies a pipe.

We take our illustration from Wood's "Natural History."



THE UMBRELLA BIRD.

Culinary Uses for Leaves.

An English writer, calling attention to a much neglected source of culinary flavors, says:

"With the exception of sweet and bitter herbs, grown chiefly for the purpose, and parsley, which is neither bitter nor sweet, but the most popular of all flavoring plants, comparatively few other leaves are used. Perhaps I ought also to except the sweet bay, which is popular in rice and other puddings, and certainly imparts one of the most pleasant and exquisite flavors; but, on the other hand, what a waste there is of the flavoring properties of peach, almond, and laurel leaves, so richly charged with the essence of bitter almonds, so much used in most kitchens! Of course such leaves must be used with caution, but so must the spirit as well. An infusion of these could readily be made, either green or dry, and a tea or table spoonful of the flavoring liquid used. One of the most useful and harmless of all leaves for flavoring is that of the common syringa. When cucumbers are scarce, these are a perfect substitute in salads or anything in which that flavor is desired. The taste is not only like that of cucumbers, but identical—a curious instance of the correlation of flavors in widely different families. Again, the young leaves of cucumbers have a striking likeness in the way of flavor to that of the fruit. The same may be affirmed of carrot tops, while in most gardens there is a prodigious waste of celery flavor in the sacrifice of the external leaves and their partially blanched footstalks. Scores of celery are cut up into soup, when the outsides would flavor it equally well or better. The young leaves of gooseberries added to bottled fruit give a fresher flavor and a greener color to pies and tarts. The leaves of the flowering currant give a sort of intermediate flavor between black currants and red. Orange, citron, and lemon leaves impart a flavoring equal to that of the fruit and rind combined, and somewhat different from both. A few leaves added to pies, or boiled in the milk used to bake with rice, or formed into crusts or paste, impart an admirable and almost inimitable bouquet. In short, leaves are not half so much used for seasoning purposes as they might be."

The Argan Tree.

Consul Drummond Hay, in his report upon Mogadore, the principal port of Morocco, mentions the existence of forests of the argan tree, which afford nourishment both for the natives and their flocks in the times of drought and scarcity. This remarkable tree grows only in certain provinces of the country, and is utilized in the following ways: In the first place, the peasants extract the oil from the nut, which is useful both for burning and cooking purposes. When the nuts ripen and fall off the trees they are collected by the natives, who are aided in the harvest by their goats. Those animals swallow the fruit for the rind, but, being unable to digest the nut they throw it up again, and it is then added by their owners to the store for making the oil. For their private consumption the peasants rarely make a large quantity of the oil at a time, but crack open a few handfuls of nuts with a stone, and after toasting the kernels in an earthenware dish, grind them to flour. The oil is extracted by adding water in small quantities to the flour, which is stirred in a bowl. As the oil is being formed by this process, the flour hardens into a cake, which is finally squeezed, leaving the oil perfectly clear and fit for use. This kind of oil cake then serves as an excellent food for cattle, as does also the dry rind of the nut, which is generally given to them with the cake, forming together their principal and most nutritious food during the year. It is invaluable to the natives in time of drought, for the argan tree is very hardy, and a dry year has little if any effect upon it. Even the empty husk of the nut, when broken, is not thrown away by the peasants, but used as fuel. The best charcoal is made from the argan tree, and the dry timber is excellent firewood. The goats feed also upon the leaves of the tree, and when browsing in the argan forest may be seen climbing among the trees, plucking and nibbling the nuts and leaves.

A New Form of Iron Manufacture.

The manufacture of a new metal, composed partly of steel and partly of iron, has been described in the *Revue Industrielle* of Paris. The novelty of this new combination consists in the introduction of a thin sheet of iron between the surfaces to be welded. A cast iron mould is divided into two departments by means of a transverse plate, or of a tube placed in the interior, and the two metals are poured into the respective compartments. Before fusion, both metals are submitted to complete refining, which removes all matters that hinder welding; they are then turned into the mould, the sheet iron partition in which serves to prevent their mingling, and to facilitate welding by being itself brought into a state of fusion. The success of the operation depends considerably on the preparation of the metals, on their readiness to weld, and on the thickness of the partition. The last is determined by experiment, and the dimensions differ according to those of the ingots to be produced. The metal thus prepared is said to be adapted to the fabrication of rails, anchors, etc., where the hardness of the metal diminishes the wear, and increases the resistance of the mass. In the construction of safes, plates of this combination are said to be proof against all attempts to break through them.

A Spruce-Destroying Beetle.

From the report of the "New York State Botanist," Mr. Chas. H. Peck, just issued, we obtain the following account of the extensive ravages of the spruce-destroying beetle (*Hylurgus rufipennis*), which appears to be doing great damage to the spruce trees in the Adirondack region. Mr. Peck says that he observed that the green slopes of Mount Emmons, commonly called Blue Mountain, and of several mountains to the north of it, had their beauty, and their value too, greatly impaired by the abundant intermixture of the brown tops of dead spruces. The destruction was also visible along the road between Newcomb and Long Lake, and on the mountain slopes far to the north of this road. Again, on the trail from Adirondack to Calamity Pond there was sad evidence that the little destroyer had invaded also the forests of Essex county. From what he saw at Lake Pleasant, in the southern part, and in the vicinity of Long Lake, in the northern part, and from information concerning the Cedar river region, in the central part of Hamilton county, he has reason to believe that much of the spruce timber of this county has already been invaded by the beetle. How much further this destructive work has extended, or will extend, it is impossible to say. But one thing is certain, it is still in progress. Upon cutting down one of the infested trees for examination, Mr. Peck found longitudinal furrows, varying from one to six inches in length under the bark, each occupied by one or two beetles. The eggs of the insect are deposited along both sides of the upper part of the furrow. They lie close to each other, almost or quite in contact. When the larvæ emerge from the eggs they begin to feed upon the soft cambium, and to work their way under the bark at right angles to the main furrow. At first they are so minute and work so close together that they make no distinct furrows, but seem rather to devour entirely a very thin layer of the cambium. As they increase in size they gradually begin to form distinct furrows, and to take directions more divergent from each other and from their original course. In this way colonies from contiguous furrows at length run together, and in time the whole trunk is surrounded by multitudinous pathways, and the death of the tree is accomplished.

Mr. Peck thinks it pretty evident that the trees are attacked all along during the months of June and July, and possibly as late as August. He suspects, also, that the parent beetle, after having established a colony in one place, may emerge from her furrow to repeat the operation in another place, either in the same trunk or in a different one, but this point he was not able to ascertain definitely.

A Geologic al Di covery in Deep Water.

During the past season's work of the U. S. Fish Commission off the Massachusetts coast many observations were taken of the temperature and density and chemical composition of the water at various depths up to 200 fathoms, with the special object of determining the physical conditions which influence the movements and migrations of the cod, of the mackerel, the menhaden, and the herring. In the course of these investigations masses of rock were dredged from all the best fishing localities, and in them were found some thirty species of fossils indicating a tertiary formation hitherto unknown. A considerable number of the fossil species were new to science.

Preservation of Milk.

On the 9th of August, 1878, P. Cunliffe Owen, Esq., Secretary to the Royal Commission, and several scientific gentlemen, were present in the Food Department, British Section of the Paris Exhibition, when Mr. Hooker, F.C.S., attended and succeeded in churning butter in a few minutes from a specimen of milk prepared by him, which had been exposed to the action of the air for a period exceeding seven years, having been prepared in May, 1871. Butter has been churned on several occasions from this sample of ancient milk before the food committee of this society, and the can of milk has been kept in the society's house, except while it was removed to be shown at the various international exhibitions, since 1871.

JUST before leaving Europe to attempt the Northeast Passage, Professor Nordenskjöld sent to the Paris Academy of Sciences an account of a new mineral recently found in Sweden, and which he has named Thaumasite ("the wonderful"). It has been met with in specimens from the Gustav and Carlsberg mines, or the Bjelke mine at Areskustan, and is a substance of strange composition, containing at once silicic acid, carbonic acid, and sulphuric acid. The microscopical analysis shows it to be a genuine new species, and not a mixture. The curious composition of the mineral is thought to be very important for a knowledge of the transformation which the materials of rocks undergo.

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TO INVENTORS.

An experience of more than thirty years, and the preparation of not less than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere. In addition to our facilities for preparing drawings and specifications quickly, the applicant can rest assured that his case will be filed in the Patent Office without delay. Every application, in which the fees have been paid, is sent complete—including the model—to the Patent Office the same day the papers are signed at our office, or received by mail, so there is no delay in filing the case, a complaint we often hear from other sources. Another advantage to the inventor in securing his patent through the Scientific American Patent Agency, it insures a special notice of the invention in the SCIENTIFIC AMERICAN, which publication often opens negotiations for the sale of the patent or manufacture of the article. A synopsis of the patent laws in foreign countries may be found on another page, and persons contemplating the securing of patents abroad are invited to write to this office for prices, which have been reduced in accordance with the times, and our perfected facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Vertical Engines, 10 to 15 H. P., thoroughly well made. John Hartrick & Co., 47 Gold street, New York.

Magic Lanterns and Stereopticons of all prices. Views illustrating every subject for public exhibitions. Profitable business for a man with a small capital. Also lanterns for college and home amusement. 74 page catalogue free. McAllister, Mf. Optician, 49 Nassau St. N.Y.

Alcott's Turbine received the Centennial Medal.

Northrop's Sheet Iron Roofing makes most durable fireproof roof. Used on all kinds of buildings. Send for circular and prices. Northrop & Co., Pittsburgh, Pa.

Engines, ½ to 5 H. P. Geo. F. Shedd, Waltham, Mass.

New Hand, Foot, or Steam Band Saws that will cut 7½ in. thick; price $35. G. W. Baker, Wilmington, Del.

Giant Car Pusher. Tackle Block Works, Lockport, N.Y.

H. Prentiss & Co., 14 Dey St., N. Y., Manufs. Taps, Dies, Screw Plates, Reamers, etc. Send for list.

Magneto Call Bells for Telephone Lines. The Best. No battery required. Bunnell, 112 Liberty St., N. Y.

Eagle Anvils 9 cents per pound. Fully warranted.

Band Saws, $100; Scroll Saws, $75; Planers, $150; Universal Wood Workers and Hand Planers, $150, and upwards. Bentel, Margedant & Co., Hamilton, Ohio.

Diamond Planers. J. Dickinson, 64 Nassau St., N. Y.

Howard Patent Safety Elevators. Howard Iron Works, Buffalo, N. Y.

Pulverizing Mills for all hard substances and grinding purposes. Walker Bros. & Co., 23d and Wood St., Phila.

The Lawrence Engine is the best. See ad. page 302.

For the most substantial Wood-Working Tools, address E. & F. Gleason, 52 Canal St., Philadelphia, Pa.

Sheet Metal Presses, Ferracute Co., Bridgeton, N. J.

Nickel Plating.—A white deposit guaranteed by using our material. Condit, Hanson & Van Winkle, Newark, N.J. English Agency, 18 Caroline St., Birmingham.

Punching Presses, Drop Hammers, and Dies for working Metals, etc. The Stiles & Parker Press Co., Middletown, Conn.

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Buffing Metals. E. Lyon & Co., 470 Grand St., N. Y.

For Power & Economy, Alcott's Turbine, Mt. Holly, N.J.

Mr. W. B. Adams, one of the most extensive contractors and decorators in this city, says he has used nearly fifty thousand gallons of H. W. Johns' Liquid Paints, and, after an experience of twenty years with white lead and other paints, he considers H. W. Johns' Asbestos Paints not only superior in richness of color and durability, but owing to their wonderful covering properties they are fully twenty per cent more economical than any others.

Wanted.—Articles to manuf. D. J. Miller, Mohawk, N.Y.

Kreider, Campbell & Co., 1030 Germantown Ave., Phila., Pa., contractors for mills for all kinds of grinding.

The only Engine in the market attached to boiler having cold bearings. F.F.& A.B. Landis, Lancaster, Pa.

Improved Steel Castings; stiff and durable; as soft and easily worked as wrought iron; tensile strength not less than 65,000 lbs. to sq. in. Circulars free. Pittsburg Steel Casting Company, Pittsburg, Pa.

Fine Gray Iron Castings a specialty, also Wire Workers' Pickets and Rosetts in stock. A. Winterburn's Foundry, 16 De Witt St., Albany, N. Y.

Jarvis Patent Boiler Setting burns wet peat, screenings without blast. A. F. Upton, Agent, 48 Congress St., Boston, Mass.

Solid Emery Vulcanite Wheels—The Solid Original Emery Wheel—other kinds imitations and inferior. Caution.—Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 38 Park Row, N. Y.

For Solid Wrought Iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Doctor Egbert Guernsey says, within the past year they have saved nearly two hundred tons of coal at the Homeopathic Asylum for the Insane at Middletown, N. Y., by use of H. W. Johns' Asbestos Pipe Coverings.

The SCIENTIFIC AMERICAN Export Edition is published monthly, about the 15th of each month. Every number comprises most of the plates of the four preceding weekly numbers of the SCIENTIFIC AMERICAN, with other appropriate contents, business announcements, etc. It forms a large and splendid periodical of nearly one hundred quarto pages, each number illustrated with about one hundred engravings. It is a complete record of American progress in the arts.

Presses, Dies, and Tools for working Sheet Metals, etc. Fruit and other Can Tools. Bliss & Williams, Brooklyn, N. Y., and Paris Exposition, 1878.

North's Lathe Dog. 347 N. 4th St., Philadelphia, Pa.

Vertical & Yacht Engines. N. W. Twiss, New Haven, Ct.

Best Turbine Water Wheel, Alcott's, Mt. Holly, N. J.

Millions of dollars now annually lost by fires could be saved by use of H. W. Johns' Asbestos Concrete Coating, which forms an absolutely fireproof surface like stone on wooden beams, posts, floors, and partitions in basements, lofts, and boiler rooms of warehouses, factories, etc. It is prepared ready for use, and can be easily applied by any one.

The Cameron Steam Pump mounted in Phosphor Bronze is an indestructible machine. See advertisement.

Baxter Wrenches, Blake's Belt Studs, Soap Stone Packing, Empire Packing. Greene, Tweed & Co., 18 Park Place, N. Y.

Wheel Press, Cotton Press, Pipe Line, and Test Mercury Gauges. T. Shaw, 915 Ridge Ave., Philadelphia, Pa.

Makers of Improved Door and Sash Machinery will please send circulars and prices to Traynham & Geise, Atlanta, Ga.

For Telephones, Amateur Photo, Apparatus, etc., address E. Sackmann & Co., 278 Pearl St., N. Y.

For Sale Cheap.—One 50 lb. Hotchkiss Air Spring Hammer, nearly new. D. Frisbie & Co., New Haven, Ct.

A Valuable Patent for an Improved Coupling for round and flat leather belts for sale. A. Sirois, Patentee, 89 Fulton St., New York.

Rubber Hose, Steam Hose, Suction Hose, Linen Hose, Cotton Hose. Greene, Tweed & Co., 18 Park Place, N.Y.

Hydraulic Press, Screw Presses, Engines, and Boilers, ½ to 200 H. P. Send for circulars. Machinery Exchange, 3d and Vine Sts., Philadelphia, Pa.

Wanted.—A 2d-hand Transit, with level on Telescope. Address, stating price, F. J. Knight, Monroe, N. Y.

The Interstate and International Mechanical Exchange. Send for explanatory circular. A. S. Gear, 20 E. 13th St., N. Y.

Wanted.—One Steam Riveter and one Machine for planing bevel edges of sheets; both suitable for boiler work. Address Boiler Maker, 111 Liberty St., N. Y.

NEW BOOKS AND PUBLICATIONS.

METHODICAL TEXT BOOK OF ROUND WRITING. By F. Soennecken. New York: Keuffel & Esser.

The style of writing which Mr. Soennecken calls round is something very different from the "round-hand" of former days. It is instead a system of ornamental writing, done with a broad pointed or double pointed pen, by means of which a bold and peculiar shading is effected without pressure. For distinctness, beauty, and ease of execution it is by all odds the most desirable ornamental hand that we know. And by Mr. Soennecken's method of instruction it would seem that any one, however unskillful as a penman, can, with the use of his pens, easily become expert. The pens numbered from 3 to 6 we find excellent for ordinary business writing.

UPLAND GAME BIRDS AND WATER FOWL OF THE UNITED STATES. By A. Pope, Jr. New York: Charles Scribner's Sons.

Part Ninth of Mr. Pope's admirable series of upland game birds and water fowl figures the mountain quail of the Sierras, *Oreortyxpictus*, Baird; and the widgeon, *Mareca Americana*, Stephens. Our high opinion of the work has already been expressed.

Notes & Queries

(1) S. B. M. asks how the "béton concrete," used in the buildings, etc., illustrated in the SCIENTIFIC AMERICAN SUPPLEMENT, No. 118, is made? A. Consult Gillmore's "Coignet Béton, and other Artificial Stones."

(2) P. W. J.—Send full name and address.

(3) G. B. G. asks: What is the composition of the steel bronze dip used by brass finishers? A. Dip the articles bright in dilute nitric acid, pass them immediately through clear water, and place in the following mixture until they turn black: Hydrochloric acid, 1 gallon; ferrous sulphate (copperas), 1 lb.; arsenious acid (pure white arsenic), 1 lb. Then remove, rinse in cold water, and dry in sawdust. It may be polished with black lead and coated with a lacquer made as follows: Spirits of wine or wood naphtha (methylic spirits), 1 gallon; shellac, 5 ozs.; sandarac, 4 ozs.; elimi, 1 oz.; turmeric, 6 ozs.; gamboge, 1 oz. Digest together in a covered vessel in a warm place, decant the varnish, digest the residue again with ½ gallon of spirit, and add this to the rest of the lacquer.

How do printers measure type when set up at so much per thousand ems? A. The unit of measurement in printing is the square of the depth of the type, called an em, because the letter *m* was at one time a square letter. The number of these squares contained in a line of type in width, being multiplied by the number of lines, or ems, in the depth of the page or column, gives the number of ems. The large type on the reading pages of this journal is brevier, 29 ems wide, 132 lines or ems in a column, equal to 3,828 ems. This result multiplied by the price gives the wages of the compositor; as, say 50 cents a thousand ems, 3,828×50=$1.91. See Webster's Dictionary, under "Type," for comparison of sizes of types.

(4) Quandary writes: I have a telephone with which I want to connect my store and house. I also have two sounders (common telegraph style). The telephones have many more ohms resistance than the sounders, which have only two ohms. How shall I connect, so that I can attract attention with the sounders? I have used 2 cells of the usual style battery, and cannot get it to work. A. Do not place the telephones in the telegraph circuit. Connect one binding post of each telephone with the line wire, and ground the other.

(5) A. Z. M. asks where to get carbon points and their probable cost. Also wants an outline of the Bell telephone, as he is trying to make one. A. You can get carbon points from any dealer in electric batteries, or you can make them by following directions given on p. 171 (1) of current volume. Full directions for making a working telephone may be found in the SCIENTIFIC AMERICAN SUPPLEMENT, No. 142.

(6) L. O. R. asks: 1. Can Spanish well be learned without a teacher? A. Not to speak it. 2. What particular textbooks, grammar, dictionary, readers, and the like, are best for an unassisted scholar? A. Consult publishers' catalogues.

(7) D. H. S. asks: Can a 4 horse power engine be made to exert 8 horse power by increasing speed to double its former rate? In other words, by doubling speed of an engine will its power be increased at same ratio? A. Yes, providing the same mean cylinder pressure be maintained. The horse power of an engine =

$$\frac{\left(\begin{smallmatrix}\text{mean pressure}\\ \text{in lbs.}\\ \text{per sq. inch.}\end{smallmatrix}\right)\times\left(\begin{smallmatrix}\text{piston speed}\\ \text{in feet}\\ \text{per minute}\end{smallmatrix}\right)\times\left(\begin{smallmatrix}\text{piston area}\\ \text{in sq.}\\ \text{inches}\end{smallmatrix}\right)}{33{,}000}$$

(8) G. H. H. writes: I have a steam engine: the cylinder is 3 inches in diameter and 4 inches stroke. What is the power, how large a boiler will it require, and what kind is the best for me to get? A. Such an engine would rate about 2 horse power. A vertical boiler, 22 inches in diameter and 4½ feet high, would be suitable for it.

(9) L. S. I. asks how to weld and temper a broken carriage spring. A. To weld, heat in a clean fire to a yellow heat, and use borax as a flux. To temper, heat it evenly to a low red, quench it in oil, and blaze it off two or three times.

(10) C. F. D. asks how to construct a cheap telephone from his room to another, distant about 150 feet. A. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 142, which contains full directions for making a telephone.

(11) A. O. writes: Please state in the SCIENTIFIC AMERICAN, for the benefit of many readers, the breaking load of a white pine pillar, 12 inches square and 40 feet long. A. Mr. C. Shuler Smith's rule is as follows:

$$\text{Breaking load in lbs. per sq. inch of area} = \frac{5{,}000}{1+\left(\frac{\text{square of length in inches}}{\text{square of side in inches}}\times 0{\cdot}0004\right)}$$

(12) Foreman.—Your data are insufficient.

(13) F. S. W. asks: 1. Which of two water wheels of equal size is best, one discharging at the center, the other at the periphery, and why? A. A question of this kind cannot be generalized, as there are other things besides point of discharge that influence the efficiency of a wheel. 2. Which of two pulleys of equal size, one with straight arms, the other with curved, is the strongest, and why? A. For equal cross sections, the straight arms are usually the strongest, for the same reason that a straight beam is ordinarily stronger than a curved one.

(14) O. V. F. asks: Does increasing the size of the arm or axle of a wagon increase or decrease the draught? A. After passing the requisite proportions, the draught is increased.

Would falling through the air from one mile in height cause death before reaching the ground? A. We think so.

(15) C. R. M. writes: I am building an ice house, 16 x 20, and 20 feet deep in the ground, with logs in the form of a square pen. Ought I to leave an open space between the logs and the earth, or had I better fill in with tan bark, sawdust, leaves, or something of that sort, as is usually done? My opinion is an air chamber or space between the earth and logs would be the best non-conductor I could have. Am I right? I find ice commences to melt around the sides next to the logs, making an open space of 10 or 12 inches. People mostly fill up the space with ice (which takes a good quantity) and others fill up with leaves, tan bark or sawdust. My opinion is to leave the space open. Am I right? A. Dry air is one of the poorest conductors of heat, but at the same time it offers no impediment to thermal radiation or convection. Walls of loose non-conducting substances, as sawdust, intercept the one and impede the other. See pp. 871, 939, 1570, and 1851 of the SCIENTIFIC AMERICAN SUPPLEMENT.

(16) W. C. S. asks: What size boiler must I have for a 1½ diameter by 2½ inch stroke cylinder? Please give thickness of the plates to be made of, and how high the water must stand in such a boiler when in working order. How long should I make the connecting rod? A. You can make a boiler 12 inches in diameter and 24 inches high. Carry the water level at about two thirds of the height. Use iron plate about $\frac{3}{16}$ thick. The connecting rod should be from 2½ to 3 times the length of stroke.

(17) X. Y. Z.—You will find in the last edition of Ganot's "Physics" a full description of Helmholtz's apparatus for the analysis and synthesis of sound. We are unable to give you the cost of the apparatus.

(18) G. G. L. writes: Some time ago you mentioned in your paper that you would be pleased to receive any communications on the practical results of small steam yachts. I send you the following description and performance of one that I have built this summer, hoping that it may be of service to others who want to build one. The boat is a lap streak, 26 feet long over all, and 5 feet beam; the planking is of pine ⅝ of an inch in thickness, the ribs are of oak ¾ of an inch thick and 1¼ inch wide, steamed and bent in, and placed 6 inches between centers. The boiler is made of steel $\frac{3}{16}$ inch thick in the shell, and the firebox and tube sheets are of iron ¼ inch thick, and is 34 inches high, 20 inches diameter, with a firebox 17 inches in diameter and 15 inches high; there are 56 inch tubes 19 inches long, the engine is vertical, with cylinder 3¼ inches diameter and 4 inches stroke, and weighs 100 lbs. The wheel is 20 inches diameter with 3 blades, and has a pitch of 34 inches, and is placed 3½ feet from stern post, thus giving room for the rudder forward of the wheel above the shaft; the shaft is supported by the stern pipe, which is 8 feet long and is made of 2 inch gas pipe, and extends from the stuffing box to the wheel, and has a bearing in each end. With 100 lbs. of steam the engine makes 325 revolutions per minute, and drives the boat 8 miles per hour in still water. The pump is ⅞ of an inch in diameter and 1¼ inch stroke, and gives plenty of water. The above results are taken from actual tests, and are correct in every particular. The results are excellent. We hope to hear from others who are experimenting in this direction.—ED.]

(19) F. B. writes: I am building a lathe. My balance wheel is a 3 part one, namely, 24 inch, 21 inch, and 18 inch diameter. I wish the pulley on the spindle to match the 24 inch part 3 inches in diameter. What shall be the diameter of the other two pulleys to match the 21 inch and 18 inch parts, so that the belt may be tight on either pulley? A. Having found the length of belt, call R the rad us that is known, S the distance between centers of pulleys, and L the length of the belt (all dimensions in feet). Then if R is the larger of the two radii, the other radius,

$$r = R - S\times\left\{1{\cdot}5708-\left(\sqrt{0{\cdot}4674+\frac{L-6{\cdot}2832\times R}{S}}\right)\right\},$$ and if R is the smaller of the two radii, the other radius,

$$r = R + S\times\left\{\left(\sqrt{0{\cdot}4674+\frac{L-6{\cdot}2832\times R}{S}}\right)-1{\cdot}5708\right\}$$

1. Can I, with a furnace like the one described on p. 404, vol. 38, SCIENTIFIC AMERICAN, and the blower described on p. 75, vol. 39, SCIENTIFIC AMERICAN, obtain heat enough to melt copper in a common sand crucible? If not, what heat can I get? A. Except in very small quantities, no. 2. At what temperature will a mixture by weight of iron ½, copper ¼, and zinc ¼, melt? A. If the zinc were not all volatilized in the operation the alloy would probably melt at about 1260° Fah.

(20) W. W. MacC. asks: Which is the better engine for a flouring mill, a long stroke and slow motion, or a short stroke and quick motion? A. We think the latter is preferable.

(21) E. H. C. asks: Will an engine having a cylinder 1½ inch in diameter and 3 inches stroke, run a boat 15 feet long? A. The engine is rather small.

(22) A. J. F. asks: How can I do enameling on gold and silver? A. The enamels used consist of a very fusible glass variously colored by metallic oxides, reduced to powder and made into a paste with water for use. These are applied to the finished surface of the metal, on which they are fused by means of a blowpipe flame or by the heat of a small furnace.

How can I make hair cosmetic? A. Fuse together 2 parts of lard and 1 part of beef suet, and incorporate by trituration any of the bouquets given on p. 1030, SCIENTIFIC AMERICAN SUPPLEMENT.

Please give me a good recipe for making cologne. A. Eau de Cologne—6 quarts 82 per cent alcohol, 2 ozs. essence of orange, 2 ozs. essence of citron, 2 ozs. oil des petits grains, 1 oz. de cedro, 1 oz. de cedron, 1 oz. de Portugallo, 1 oz. neroli, ½ oz. rosmarinol, ¼ oz. thymol.

(23) T. H.—In your first inquiry the data are insufficient. Rosin is sometimes applied to belts to prevent slipping, but there never should be occasion for its use.

(24) A. I. asks: What size propeller wheel is required for an 8¼ by 8 inch engine, and what pitch wanted for towing and running partly, and which is the best make to buy? A. A propeller suitable for such an engine may have a diameter of from 3½ to 4 feet, and a pitch of from 5 to 6. We do not recommend special manufactures in these columns.

(25) C. C. B. writes: I wish to raise water for domestic use to a perpendicular height of two hundred feet, and deliver six hundred feet from supply point. Is the hydraulic ram practicable for this height? A. You can use a ram for the purpose, but it may be necessary to fit pipe of extra strength. A manufacturer will give you full instructions as to fall, etc.

(26) W. M. E. writes: Which is best for seasoning white oak, open air, kiln or steam? A. Air seasoned timber is generally considered the best, but the difference is not great.

Does a 40 inch circular saw, 26 teeth, gauge 7, sawing a plank 16 inches wide, take more or less power than a 50 inch, 26 teeth, gauge 7, on 16 inch plank, both run on same speed of mandrel? A. Less, as we understand the conditions.

(27) R. H.B. asks: 1. What is sumac used for in chemistry? A. Sumac is used principally in dyeing and tanning. 2. Where is the best quality procured in the United States, and how does it rate in the market with that brought from Italy? A. Virginia. Fine Sicilian powder, $120; Virginia, $65 per ton. Poorer qualities sell at from $50 to $60 per ton. 3. How is it prepared for market? A. The leafy tops are broken off and dried in the shade. When dry they may be beaten with sticks or flails. The gathering of the leaves may commence in July and continue till frost. It may be packed in bags preparatory for shipment to market. The amount of tannin contained is from fifteen to twenty per cent.

(28) F.—In your thread telephone use a single silk or linen thread.

(29) S. E. W. asks (1) for some good durable cement or glue not affected by moisture, that will secure rubber to tin. A. Fuse together equal parts of gutta percha and pitch. Have the metal dry and use the cement moderately hot. 2. How can I make some cheap blue, black or green ink, such as is used by large rubber roller printing machines for marking wood; it is to be applied to a roller covered with felt, which revolves in contact with another roller on which is secured the rubber type? A. See p. 204 (33), current volume.

(30) W. T. M. asks: What oil or oils will make a photograph, or other pictures, transparent on glass and not spot in a short time after? A. Cover the face of the moistened print with good starch paste containing a drop or two of clove oil, press the picture face downward on the clean glass, press out the excess of paste, and dry. Then saturate the paper with castor oil, wipe off excess, cover with a thin glass plate for protection, and bind the edges with cloth or paper and paste.

(31) H. A. P. asks: What will remove the smoky discoloration of 10 years' standing on an Italian marble mantel, occasioned by being over a heater in parlor? A. Moisten quicklime with a strong cold aqueous solution of sal soda, and rub this paste over the marble to remain for several hours. Then clean off and wash

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well with clean hot water and a stiff brush. A thick solution of silicate of soda (water glass) is said to answer better than lime and sal soda—it may be mixed with a little slaked lime, kaolin or whiting.

What causes the noise from a heavy cart wheel in motion on stone pavement? And why is the noise greater when the cart is heavily loaded? A. It is caused by the dropping of the wheels from the tops of the paving stones into the depressions between them. The force of the blow increases with the weight of the wagon.

(32) S. T. L. asks for a recipe for making rubber cement. A. Digest caoutchouc cut in fine shreds with about 4 volumes of naphtha, in a well covered vessel for several days. Naphtha should not be used indoors.

(33) H. E. H. asks (1) how to make a good cheap bottle wax. A. Resin, 6½ parts; beeswax, ½ part; Venetian red or red lead, 1½ lb. 2. Shellac, 3 parts; Venice turpentine, 1¼ part; vermilion, 2¾ parts, or Venetian red or red lead, q. s. 3. Resin, 6 parts; shellac and Venice turpentine, each 2 parts; coloring matters to suit. The bubbling is due to overheating the wax, moisture in the stopper, or both. It is often advantageous to slightly oil the stopper.

(34) G. H. A. asks: What will prevent the accumulation of dandruff? A. See p. 27 (1), and 188 (43), SCIENTIFIC AMERICAN, vol. 38.

(35) A. O. K. asks for a recipe for making a good white ink, such as is used on the sample card inclosed. A. Mix pure, freshly precipitated barium sulphate with water containing enough gum arabic to prevent immediate settling of the substance. Starch or magnesium carbonate may be used in a similar manner—they must be reduced to impalpable powders.

1. Is there any danger attending the use of petroleum for removing scale in boilers? A. If the quantity introduced is small no danger need be apprehended. 2. Which gives the best results, the crude or the refined article? A. The latter is generally used.

(36) G. B. F. asks: By what process is the black lettering done upon saw blades? For instance, Disston's card on the Centennial saw; it is evidently printed and etched, as they are all alike, which would not be the case if drawn by hand through a waxed surface. A. Stencils are employed, we believe. Use in etching pyrogallic or dilute nitric acid or aqueous iodine solution.

(37) L. B. & Co. write: In making autoplates it is necessary for us to use a battery, and we would like you to inform us which of the many that are for sale is the best for our purpose, and how many cells we will have to use to deposit an ⅛ of an inch of copper over say 10 to 15 square feet of surface, in a tank measuring 2 x 2 x 3 feet, in the shortest possible time. A. The Smee cell with carbon negative plates is, we believe, generally preferred; but for work of this kind a magneto-electric machine is better than batteries. The power (number of cells) required is estimated in battery zinc surface about equal to the surface of the work exposed in the plating bath. It would require many hours to deposit a shell of the thickness you mention.

(38) J. A. S. asks: 1. Can nitrous oxide gas be made by heating nitrate of ammonia in a flask, and is there any danger of an explosion? A. If no carbonaceous or combustible matters are present, there is no danger. 2. Is oxygen explosive alone or mixed with air? A. No.

(39) D. R. writes: No. 20, vol. 38, contains an article on "How to make a strong Electro-Magnet." Desiring such to ring an 8 inch bell, I followed the instructions given, wrapping the iron pipe with three layers of insulated wire (inclosed sample), and attached the ends to a battery of 7 cells (disk) Leclanche in good working order. The results were not satisfactory, the magnet showing very little power, not sufficient to move the clapper rapidly. Can you explain the difficulty? Is the wire too large and the layers insufficient? A. The wire is too heavily covered with cotton. For the purpose named we think a magnet of the ordinary form would be better than the one you describe.

(40) A. W. C. asks: What substances can I dissolve in alcohol, that the flame will be blue when burned in a spirit lamp, and also the ingredients for producing a red flame in the same manner? A. We know of nothing soluble capable of producing very satisfactory flame colorations of these orders. For red you may try a little strontium nitrate, and for blue bismuth nitrate or indium chloride.

(41) W. H. E. W. writes: I am using water from a driven well, iron pipe and pump; the water is strongly impregnated with iron; is it injurious to my health? A. If the quantity of iron is excessive, yes.

(42) F. D. W. asks for a recipe for bleaching white holly which has turned yellow by age. A. You may try a strong aqueous solution of sodium sulphate, also solution of calcium hypochlorite (bleaching powder).

(43) E. A. F. asks: 1. What is the composition of the explosive called "white gunpowder?" A. Potassium ferrocyanide (yellow prussiate), 28 parts; loaf sugar, 23; potassium chlorate, 49. 2. I understand that it is easily manufactured, and that its projectile force is much greater than gunpowder. Why is it not more used? A. The principal reasons are that the manufacture of this powder is very expensive, and that, as the powder acts very strongly upon iron and steel during ignition, it can only safely be used in bronze ordnance and in the filling of shells.

(44) J. H. M. asks how to mix a gold solution for battery gilding for copper alloys, one that will work well in cold weather. A. Dissolve 12 ozs. of potassium cyanide in a gallon of water, and in this dissolve ½ oz. of oxide of gold.

(45) B. M. A. and C. P. K.—The simple electric light apparatus is not in the market. See SCIENTIFIC AMERICAN SUPPLEMENT of November 9 for a description of the apparatus which will enable you to make it.

(46) E. A. D. asks: What chemicals will remove ink blots from paper, when dry? A. Try a strong solution of bleaching powder in cold water or acetic acid, also strong aqueous solution of oxalic acid.

Will the use of goggles injure the eyes in any way? A. We do not think that goggles having smoke colored glasses would injure the eyes.

(47) W. L. I. writes: Will you please tell me the different parts of speech of the different "thats" in the following verse?

"For it is known that we may safely write,
Or say, that that that that that man writ was right;
Nay, e'en, that that that that that that followed
1 2 3 1 2 3
Thro' six repeats the grammar rule has hallow'd;
And that that that that that that that began
1 2 3 4
Repeated seven times is right. Deny it who can."

A. 1. Relative pronoun. 2. Definitive adjective. 3. Noun. 4. Not justifiable.

(48) P. W. J. should repeat his questions, giving full name and address.

(49) J. F. F. asks: Has compressed air ever taken the place of steam, and if so, to what extent? Can it ever be used for motive power on railroads? A. It is largely used in tunneling operations, and has been used on railroads as you suggest.

If the perpetual motion could be made, would it be of any use? A. Yes.

I have an oxycalcium stereopticon; can I use an electric light as a substitute. If so, please give me information for obtaining an electric apparatus. A. Yes. Insert a notice in the "Business and Personal" column if you do not find what you want among the advertisements.

(50) C. B. P. writes: I have two cylinders 2½ x 5 in., which I should like to make use of to run a small yacht. What would be the most advantageous size, as regards largest possible dimensions and quickness of speed for my boat? Provided my boiler be of copper, how and of what shape should it be made, and of what thickness, to insure minimum space and weight? What lap and lead ought the valve to have, and what diameter and pitch the screw? A. With a boat 28 feet long, screw 30 inches diameter, 3 feet pitch, vertical boiler with 100 square feet of heating surface, engine ⅛ inch lead, cut-off ¾ stroke, you might expect a speed of 7 to 8 miles an hour in smooth water.

Are any magazines or papers published in Australia or New Zealand devoted to the interests of mechanical engineering? Would you give me the names and addresses of the best? A. Perhaps some of our friends in these localities will send the information desired.

(51) R. D. B. writes: I have all the parts of a Grove galvanic battery except the porous cups. How can I make them, or is there anything I can use as a substitute for them? A. Porous cups cannot be easily made except by potters. Use an unglazed flower pot.

(52) A. K. S. writes: I wish to ascertain the exact horse power of an engine 30 inches bore, 36 inches stroke, running 75 revolutions per minute under a boiler pressure of 80 lbs. steam; the engine stands about 40 feet from steam dome, or, in other words, there is 40 feet of steam pipe. I want the exact horse power of that engine, there are so many different opinions. A. It cannot be calculated unless the mean pressure acting on the piston during each stroke is known, and this can only be determined by experiment.

(53) F. W. M. asks how much carbonic acid gas can be made from 1 pound or 1 quart marble chips; also what proportion of sulphuric acid to use. A. If the marble is reasonably pure, about 30 cubic feet.

Marble + sulphuric acid (specific gravity 1·8) =
100 98
calcium sulphate + water + carbonic acid. Under normal
136 18 44.

conditions of atmospheric pressure and temperature a cubic foot of carbonic acid weighs about 1·8 oz. The amount of oil of vitriol to be used in practice is somewhat greater than that above indicated. It should of course be diluted with water.

(54) D. I. C. writes: I am between the age of forty-nine and fifty, somewhat past the time when men generally begin to lose their sight, and mine is beginning to fail. I am naturally nearsighted, my ordinary distance for reading being about eight inches; but now if I hold small print, say Webster's pocket dictionary, that close, the letters become blurred and run together, and the closer to the eye the worse blurred; but if when blurred the worst and most indistinct I close the eyelids one half or more, I find the letters to appear sharp and clear. Can this be explained? A. Closing the lids of the eyes tends to flatten the crystalline lens, and by this means to focus the eyes on the object. It may also help to make the image sharper by shutting out side lights.

(55) G. E. H. asks: How can I cut out circular pieces of looking glass about ¼ of an inch in diameter; I am not particular about the thickness, but the surface of the glass must be perfectly plane, as the least convexity or concavity would mar its application, and the reflecting substance—whatever it might be—should not be defaced. A. Very thin glass, like microscope slide covers, may be cut with a diamond. Thick pieces of the diameter given could not well be cut in this way. You might do it with an iron or copper tube having ¼ inch internal diameter rotated rapidly and supplied with emery and water. It would probably be best to silver the disks after they are cut.

(56) J. G. asks: Am I right in saying that the first elevated railroad car was driven by a stationary engine with wire rope attached? A. Yes.

(57) R. W. S. asks: 1. Will you please inform me whether frost has any effect upon spiral springs which are in use in cold weather out of doors? A. They sometimes become more brittle. 2. What is the best material for spiral springs for hard usage? A. Spring steel.

(58) H. T. W. writes: In an article published recently, headed "New Industrial Enterprises," the question is asked: "Is it not practicable to teach our farmers that they may produce all the flax fiber as fast as required?" I am much interested in the question, and wish to know how to obtain statistics as to the trade as far as this country is concerned. That is, the quantity manufactured, imported, and grown, and the parts of the country in which the larger quantity is raised, prices, etc. Also in relation to the seed for oil purposes, whether it is mostly imported, from where, and in fact everything in connection with the industry, with a view to getting at the desirability of engaging in it. A. See article on the subject, p. 400, vol. 38, SCIENTIFIC AMERICAN. There are several books on the cultivation and treatment of flax in print. Address booksellers who advertise in these columns. For statistics consult the reports of the Bureau of Statistics and of the Department of Agriculture.

(59) S. J. M. asks: 1. At what depth is the minimum of temperature reached? In other words, how far below the surface of the earth does the heat of the sun penetrate? A. It varies in different parts of the globe; at Paris it is about 30 yards. 2. Would an extra thick arch over a cellar diminish the temperature at its bottom more than a simple covering to keep out the sunlight, etc.? A. Yes.

(60) L. H. I.—See "Rights of Investigators," p. 128, current volume. SCIENTIFIC AMERICAN SUPPLEMENT, No. 133, contains full directions for making a phonograph.

(61) E. B. B. asks: Will you please give the process for making rubber stamps for printing, from the making of the mould to the finishing of the stamp? A. You will find an article on this subject on p. 1326, SCIENTIFIC AMERICAN SUPPLEMENT. See also p. 204 (33), current volume, SCIENTIFIC AMERICAN.

(62) L. W. F. asks: What substance can I cast readily in moulds that will possess the flexibility and hardness of India rubber upon cooling? A. The following composition is very flexible, resembles caoutchouc somewhat, and may be readily fused and cast. Glue is melted in water by the aid of a hot water bath into a very thick paste, to which glycerin is added in about the same quantity as that of the dry glue. The mixture is then thoroughly stirred and further heated to evaporate the excess of water. Sawdust, pigments, metallic oxides, earths, etc., may be added to color, toughen or harden the substance.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

J. P.—If properly burned and ground the substance might be used with oil as a cheap paint, and to a limited extent by paper makers.—H. H. C.—No. 1 (black) is an indurated clay containing much finely divided carbon. If properly ground it might be useful as a substitute for lampblack in some cheap paints, etc. No. 2 (red), is an earth consisting largely of an iron sesquioxide, various grades of which are known in the market under the names of red earth or ocher, burnt ocher, Indian red, Berlin red, English red, Armenian bole, terra di sienna, etc., and much used in paints.—D. L. B.—It is marcasite—sulphide of iron, of little value.—J. S. R.—Quartz.—A. M. K.—It is celestite inclosing sulphur.—D. R.—The smaller fragments are magnesium limestone or dolomite. You should send larger samples.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges with much pleasure the receipt of original papers and contributions on the following subjects:

Wooden Buildings. By D. F. H.

Lenses. By C. A. C.

HINTS TO CORRESPONDENTS.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Many of our correspondents make inquiries which cannot properly be answered in these columns. Such inquiries, if signed by initials only, are liable to be cast into the waste basket.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

September 10, 1878,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list, including both the specifications and drawings, will be furnished from this office for one dollar. In ordering, please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city.

Air compressor, W. D. Doremus	207,954
Anodes, holding grain nickel, A. C. Wenzel	208,003
Anti-attrition compound, J. Kimball	207,874
Apiary or bee house, W. Erwin	207,958
Atomizer, G. A. Brug	207,849
Bag and sack, J. Arkell	207,933
Bag fastener, Theakston & Fouts	207,996
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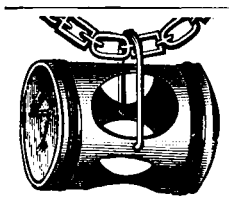

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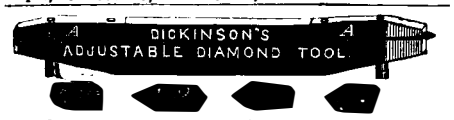

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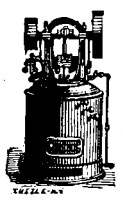
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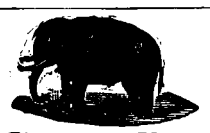
REGISTERED  TRADE MARKS
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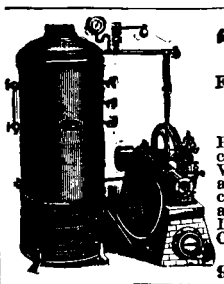
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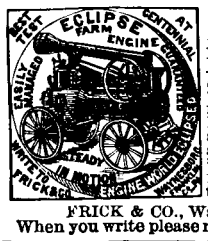
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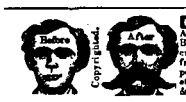

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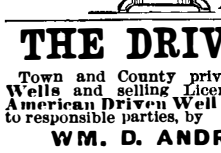
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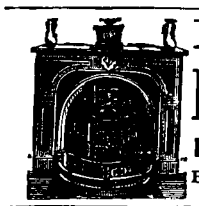
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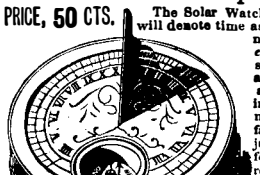
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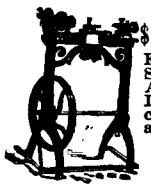

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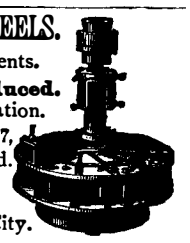

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